BROOKHAVEN NATIONAL LABORATORY

Work Permit # SDD-2016-014
Work Order # ___
Job# ___ **Activity#** ___

See "Instructions for Filling out the Work Permit" contained in the Work Planning and Control for Experiments and Operations Subject Area.

1. Work request WCC fills out this section. ☐ **Standing Work Permit**

Requester: Don Lynch	Date: 10/21/2016	Ext.: 2253	Dept/Div/Group: PO/PHENIX
Other Contact person (if different from requester): Carter Biggs			Ext.: 7515
Work Control Coordinator: Carter Biggs		Start Date: 10/21/2016	Est. End Date: 12/1/2016
Brief Description of Work: MuTr Station 2 & 3 north and south removal and disposal			
Building: 1008	Room: IR & AH	Equipment:PHENIX MuTr Sta 2&3 N&S Detector Subsystems	Service Provider: PHENIX Techs, Engineers & Subsystem Experts, PHENIX Electrician, C-A Carpenters and Riggers

2. WCC, Requester/Designee, Service Provider, and ESSH (as necessary) fill out this section or attach analysis

ESSH ANALYSIS

Radiation Concerns	☐ None	☒ Activation	☐ Airborne	☐ Contamination	☐ Radiation	☐ NORM	☐ Other

☐ Special nuclear materials involved, notify Isotope Special Materials Group ☐ Fissionable/Radiological materials involved, notify Laboratory Nuclear Safety Officer

Radiation Generating Devices: ☐ Radiography ☐ MoistureDensityGauges ☐ Soil Density Gauges ☐ X-ray Equipment

Safety and Security Concerns	☐ None	☐ Explosives	☐ Transport of Haz/Rad Material	☐ Pressurized Systems
☐ Adding/Removing Walls or Roofs	☐ Critical Lift	☐ Fumes/Mist/Dust*	☐ Magnetic Fields*	☐ Railroad Work
☐ Asbestos*	☐ Cryogenic	☐ Heat/Cold Stress	☐ Nanomaterials/particles*	☒ Rigging
☐ Beryllium*	☐ Electrical	☐ Hydraulic	☐ Noise*	☐ Silica*
☐ Biohazard*	☒ Elevated Work	☐ Lasers*	☐ Non-ionizing Radiation*	☐ Security Concerns
☐ Chemicals/Corrosives*	☐ Excavation	☐ Lead*	☐ Oxygen Deficiency*	☐ Suspect/Counterfeit Items
☐ Confined Space*	☐ Ergonomics*	☐ Material Handling	☐ Penetrating Fire Walls	☐ Vacuum

Ladder Access Required: ☒ Portable Ladder ☐ Fixed Ladder– Status/Restrictions:

* Safety Health Rep. Review Required	☐ Haz, Rad, Bio Material Exceed DOE 151.1-C Levels - Contact OEM	☐ Other

Environmental Concerns	☒ None	☐ Work impacts Environmental Permit No.	
☐ Atmospheric Discharges (rad/non-rad/GHG)	☐ Land Use Institutional Controls	☐ Soil Activation/contamination	☐ Waste-Mixed
☐ Chemical or Rad Material Storage or Use	☐ Liquid Discharges	☐ Waste-Clean	☐ Waste-Radioactive
☐ Cesspools (UIC)	☐ PCB Management	☐ Waste-Hazardous	☐ Waste-Regulated Medical
☐ High water/power consumption	☐ Spill potential	☐ Waste-Industrial	☐ Historical Enviornmental Hazards
Waste disposition by:			☐ Other

Pollution Prevention (P2)/Waste Minimization Opportunity: ☒ No ☐ Yes Environmental Preferable Products Available: ☐ No ☐ Yes

FACILITY CONCERNS	☒ None	☐ Intermittent Energy Release	
☐ Access/Egress Limitations	☐ Electrical Noise	☐ Potential to Cause a False Alarm	☐ Vibrations
☐ Credited Controls (Use USI Process)	☐ Impacts Facility Use Agreement	☐ Temperature Change	☐ Other
☐ Configuration Management	☐ Maintenance Work on Ventilation Systems	☐ Utility Interruptions	

WORK CONTROLS

Work Practices

☐ None	☐ Exhaust Ventilation	☒ Lockout/Tagout	☐ Spill Containment	☐ Security (see Instruction Sheet)
☒ Back-up Person/Watch	☐ HP Coverage	☐ Posting/Warning Signs	☐ Time Limitation	☐ Other
☐ Barricades	☐ IH Survey	☒ Scaffolding-req's inspection	☐ Warning Alarm (i.e. "high level")	☐ Electrical Inspection Required

Personal Protective Equipment

☐ None	☐ Ear Plugs	☒ Gloves, as necessary	☐ Lab Coat	☒ Safety Glasses, where req'd		
☐ Coveralls	☐ Ear Muffs	☐ Goggles	☐ Respirator*	☐ Safety Harness		
☐ Disposable Clothing	☐ Face Shield	☒ Hard Hat, as req'd	☐ Shoe Covers	☒ Safety Shoes, as req'd	☐ High visibility cloths/vest	☐ Other

Permits Required (Permits must be valid when job is scheduled.)

☒ None	☐ Cutting/Welding	☐ Impair Fire Protection Systems
☐ Concrete/Masonry Penetration	☐ Digging/Core Drilling	☐ Rad Work Permit-RWP No
☐ Confined Space Entry	☐ Electrical Working Hot	☐ Other Confined Space 2A certification

Dosimetry/Monitoring

☒ None	☐ Heat Stress Monitor	☐ Real Time Monitor	☐ TLD
☐ Air Effluent	☐ Noise Survey/Dosimeter	☐ Self-reading Pencil Dosimeter	☐ Waste Characterization
☐ Ground Water	☐ O_2/Combustible Gas	☐ Self-reading Digital Dosimeter	☐ Other
☐ Liquid Effluent	☐ Passive Vapor Monitor	☐ Sorbent Tube/Filter Pump	

Training Requirements (List specific training requirements)

PHENIX Awareness, C-A Access, (where appropriate: Crane Operator, Fork lift Operator, Working at heights, Electrical Safety I, LOTO

Work screening has identified the following as the reason for permitted work:	**When work is categorized as worker planned work and a permit is used only the following signatures are required: (Although allowed, there is no need to use back of form)**	
☐ **ESSH**	WCC:	Date:
☐ **Complexity**	Service Provider:	Date:
☐ **Work Coordination**	Authorization to start:	Date:
☒ **Permit Not Required** (Sections 3 through 7 optional)	(Department/Division, or their equivalent, Sup/WCC/Designee)	

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

Work Plan (procedures, timing, equipment, scheduling, coordination, notifications, and personnel availability need to be addressed in adequate detail): See attached work plan and procedure
Special Working Conditions Required (e.g., Industrial Hygiene hold points or other monitoring) None
Notifications to operations and Operational Limits Requirements: None
Post Work Testing, Notification or Documentation Required: See Attached Plan

Job Safety Analysis Required: ☐ Yes ☒ No	Review Done: ☒ in series ☐ team

Reviewed by: * Primary Reviewer signature (not required for Worker Planned Work) means that the Review Team members were appropriate for the work that was planned, the Team visited the job site, hazards and risks that could impact ESSH have been considered and controls established according to BNL requirements. In addition, this signature indicates that applicable JRAs, FRAs, as well as other planning documents have been reviewed and training requirements have been identified and recorded on this permit.

Title	Name (print)	Signature	Life #	Date
ES&H Professional				
F&O Facility Project Manager				
Service Provider				
Work Control Coordinator	Paul Giannotti			
Safety Health Representative				
Research Space Manager				
Other				
Other				
Required Walkdown Completed				
*Primary Reviewer				

4. Job site personnel (Supervisor and workers) fill out this section.

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments) and all training required for this permit is current/complete. Job Supervisor/Contractor Supervisor signatures also includes verification that worker training required for this permit is current/complete.

Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:

Workers are encouraged to provide feedback on ESSH concerns or on ideas for improved job work flow. Use feedback form or space below.

5. Department/Division, or their equivalent, Line Manager or Designee

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)

Name:	Signature:	Life#:	Date:

6. Worker provides feedback.

Worker Feedback (use attached sheets as necessary)

a) WCM/WCC: Are there any changes as a result of worker feedback? ☐ Yes ☐ No

Note: See Work Planning and Control for Experiments and Operations Subject Area section 2.6.

7. Post Job Review/Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of job site to work supervisor.) The WCC ensures that the change process to update drawings, placards, postings, procedures, etc., is initiated, if necessary.

Name:	Signature:	Life#:	Date:
Comments:			

Attachment to W.P. #SDD-2016-014 October 21, 2016

MuTr Station 2&3 (North and South)

Introduction

The Muon Tracker Station 2&3, or MuTr Sta. 2&3, are detector subsystems on both the north and the south Muon Magnets. These detectors consists of four quadrants of MuTr detectors of relatively light weight components mounted on the Inside of the North and South Muon Magnets (MMN &MMS).

The PHENIX Collaboration will remove and dispose (recycle as mixed electronic equipment) these detector subsystems during the 2016 PHENIX Removal and Repurposing (R&R) starting during the shutdown after run 16 and continuing to completion after run 17. This document describes the work plan to remove and dispose of the full complement of 2 stations (north and south) for the detector. (Note: R&R of the north detector is essentially the same as for the south. Steps described below are essentially the same for north and south.)

Access to the station 2&3 MuTr equipment will be achieved using work platforms as designed by PHENIX engineering from standard scaffolding parts and unistrut. Alternatively the work may be performed using man lifts operated by appropriately trained technicians. For more information on these work platforms refer to PHENIX Document # DRL-ECD- 2012-002" "PHENIX MMN & MMS Internal Work Platforms ". (copy attached)

1. MuTr station 2&3 (north and south) removal/re-installation procedure.

(The MuTr Station 2&3 North and South Installation procedures and the MuTr 2&3 North and south "spider" support structure installation procedures are attached to this work permit and shall be consulted and in general the procedures shall be reversed to de-install all MuTr 2&3, North and South detectors, utilities, and support structures. These procedures also contain all relevant details concedrning lifting and handling fixtures and equipment required to perform these tasks.)

Prior to commencing any work inside the MMS and/or MMN the upper 5 lampshade panels and any equipment/services attached to them and/or impeding their removal shall be removed and disposed of in accordance with the work permits for each of these magnets, SDD-2016-010 and SDD-2016-022, respectively.

In general all of the work required to remove these detector components is considered worker planned work and all of the equipment removed shall be discarded in the PHENIX R&R mixed metals and electronics receptacles after passing activation check by BNL Health Physics (HP) technicians. Any equipment that does not pass HP screening shall be disposed of appropriately and in accordance with BNL policy as directed by the PHENIX R&R Coordinator.

2.0 Installation Closeout

When all work described in this work permit has been completed, the PHENIX work coordinator for this set of tasks shall collect feedback from all parties. This feedback shall include critical review of any problems encountered during R&R tasks, solutions to such problems, changes to work procedures described herein during the conduct of this work, suggestions for improvements in equipment procedures and techniques and any other information deemed useful and/or relevant by the PHENIX work control coordinator. Such information shall be appropriately disseminated to the various affected/interested parties and a copy of this information shall be attached to this work permit when it is closed out.

TITLE:

PHENIX MMN & MMS Internal Work Platforms

PREPARED BY: Don Lynch, P.E.

CHECKED BY: _____

Introduction

Access to all internal areas of the PHENIX Muon North Magnet (MMN) and Muon South Magnet (MMS) is required during the 2012 shutdown for the following purposes:

1. To allow MuTr experts and PHENIX technicians to perform maintenance on MuTr detector electronics, wherein certain electronics components (capacitors) whose presence is necessary and have a beneficial effect on the operation of the detector, are to be installed. This operation is referred to as MuTr clamp-on capacitors in PHENIX technical group parlance. This work will be performed in the area known as the station 3 area of the MMS and MMN. Access to this area requires elevated work platforms.

2. To allow installation of new electronic terminator boards on MuTr detector subsytem. This work will be performed in the area known as the station 2 area of the MMS and MMN. Access to this area requires elevated work platforms.

3. In addition to the above work, Muon Trigger experts require access to a number of front end electronics (FEE) components in station 3 of the MMN and station 2 of the MMS for fault isolation and repair of FEE boards. The same elevated work platforms to be used for the above 2 efforts shall be used for this work.

The work platforms to be used in the these areas are new custom designed steel unistrut framed platforms that are rigidly anchored to multiple hard mount points on the MMS and MMN

The structural design of the modified work platforms will be analyzed herein.

Requirements:

The work platforms herein described comply with BNL requirements as defined in the BNL SBMS Subject Area: **Walking and Working Surfaces**, section 6 **Using Scaffolds,** in particular with the explicit requirements therein and in the OSHA requirements set forth in **29 CFR 1910.28**, and **29 CFR 1926.452.**

It is noted here that these work platforms are not pre-engineered scaffolding and as such, the analyses provided herein pertains only to the specific use described herein and in the specific configurations described herein. Any modification to the specific design described herein requires approval by a qualified engineer.

MMS Work Platforms

Work platform design for internal use in the MMS requires a custom approach for the following reasons:

- The space inside the MMS is irregularly shaped and has multiple delicate experimental structures to be built around and is thus not suitable for conventional pre-engineered scaffolding.
- The platforms need to be modified several times during the varying tasks to be accomplished during shutdown
- The platforms need to be rigid to allow safe work in the areas which surround the delicate detector panels and magnet coils.
- The platforms need to be temporary structures that must be completely removed to restore the PHENIX magnets to their run-time configuration.

It has been determined that a custom structure built from steel unistrut beams rigidly attached the MMS steel structure provides an effective versatile, easy to erect and disassemble solution to this problem

The design load for this structure shall be 2 persons per level, 3 persons, maximum, total, at any one time. (***Note: This design load must be explicitly stated in all work permits for which these work platforms will be utilized.***) A conservative calculation of stresses within the structure can be made by assuming the entire load per platform (2 persons is taken by the cross member at either end of the platform as a concentrated load at the center of the span. A simple beam calculation then provides the maximum bending stress in the beam. The platforms themselves are designed and rated for 2 persons, and thus do not require separate analyses. The only other significant loads to be considered are buckling loads in the vertical members. This can be conservatively calculated by assuming that the entire load is at one end of the platform and the combined load of the platforms, all persons on the platforms (3 maximum) and the vertical and horizontal members comprising the specific section of the platforms is taken by one vertical member. All beam calculations assume the beams are pinned at both ends.

The most critical calculation for a horizontal load carrying beam is then for the beam with the longest unsupported length. For the column buckling calculation, the worst case buckling load is for the longest unsupported vertical section. For conservatism we will assume that the columns are pinned at the top and bottom.

Figures 1 and 2, below, show the MMS work platform design.

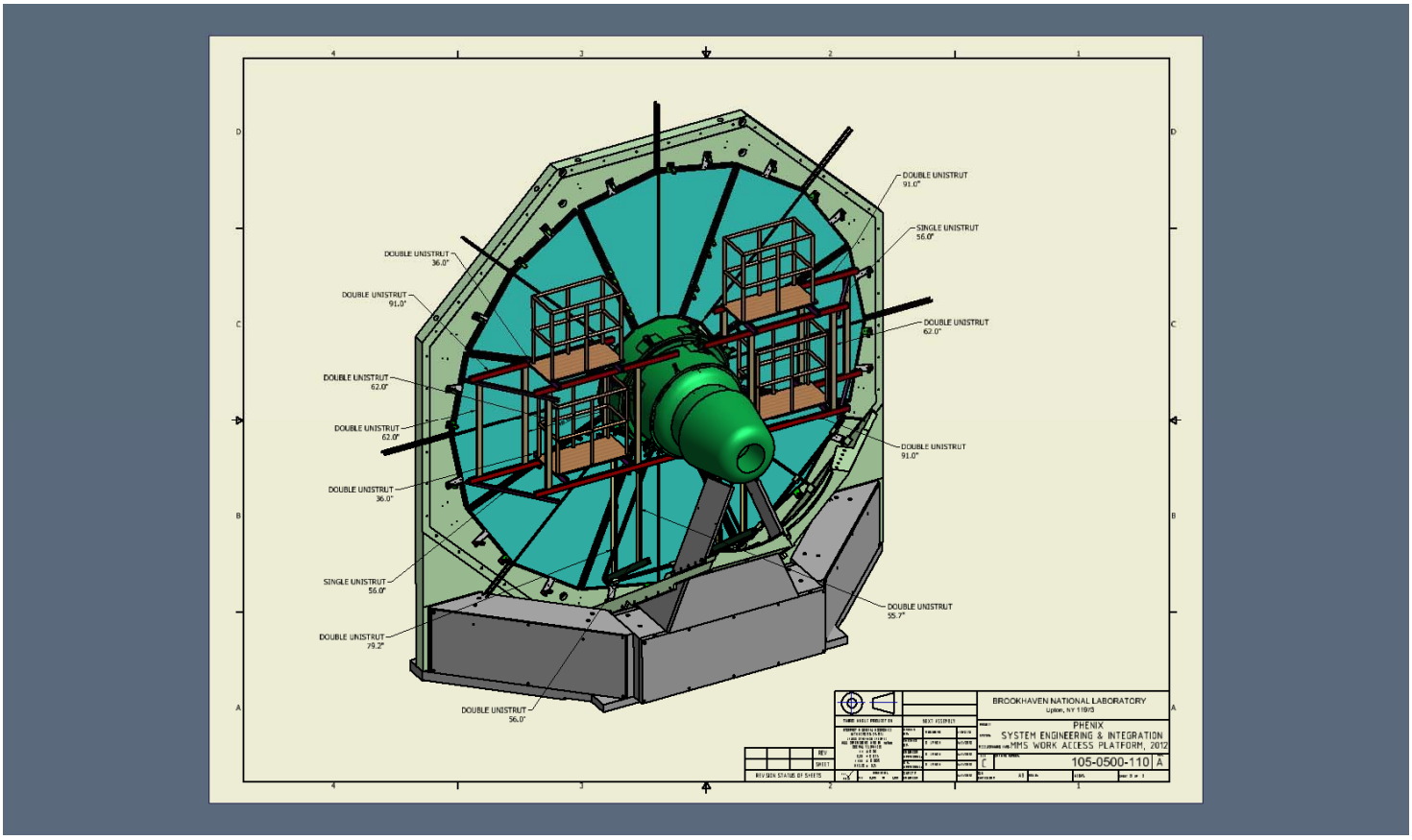


Figure 1: MMS Work Platfom with MMS shown

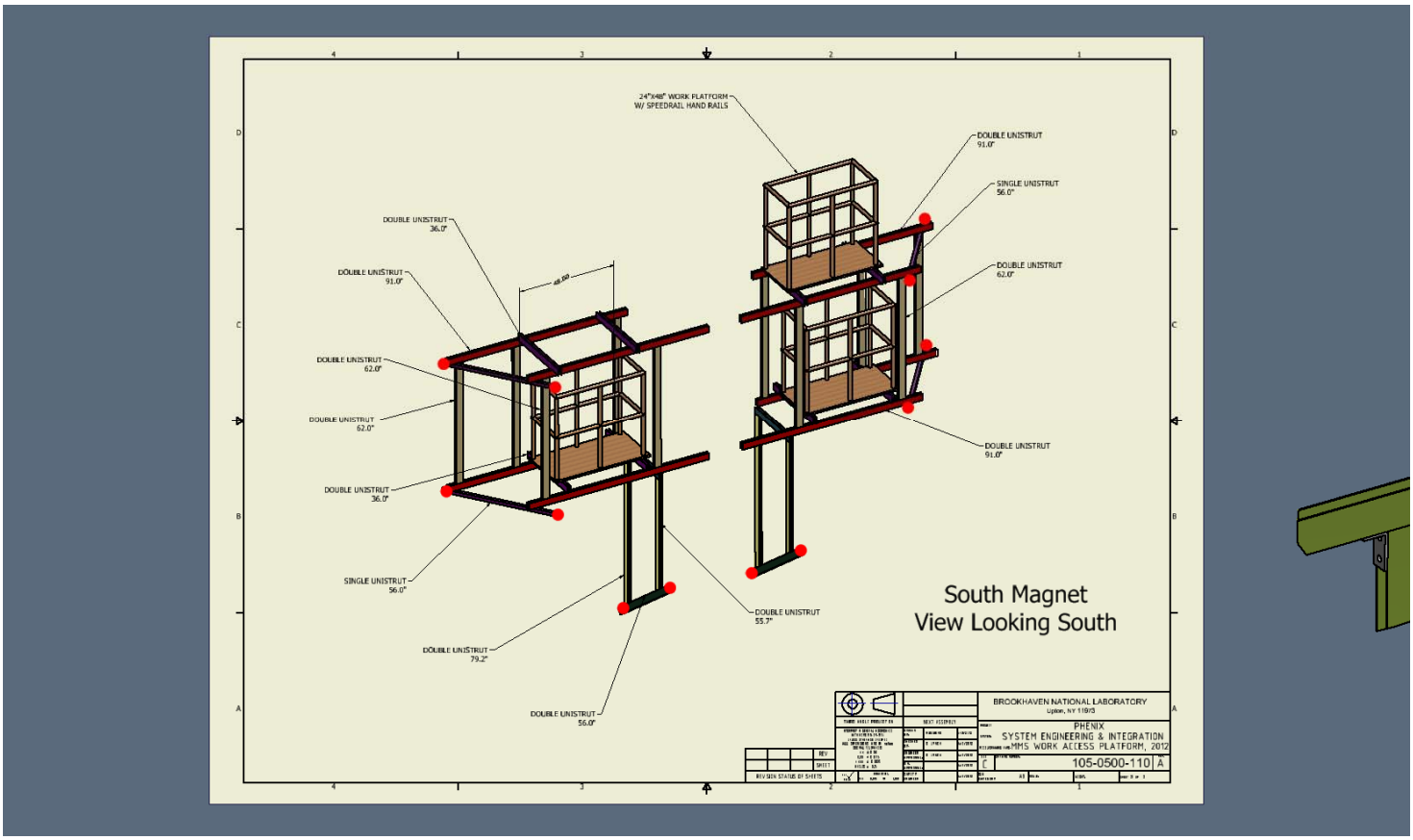


Figure 2: MMS Work Platfom with MMS hidden (circles are points of attachment to the MMS)

L_{hor}= the longest horizontal section of unistrut (double unistrut) is 91 inches (before additional support column is added).

L_{ver} = the longest vertical unsupported section ((double unistrut) is 79.2 inches.

The design load for horizontal members = (2 persons + platform + 91 in double unistrut at 3.8 lbs/ft) = (600 +50 + 28.8) = 678.8 lbs.

The design load, vert. columns= (3 persons + 2 platforms + {79.2" + 62" + 36" in double unistrut @ 3.8 lbs/ft})=
(900 + 100 + 56) = 1056 lbs

For double unistrut (P1001) 96" long channels the maximum uniform load is 1200 lbs (from unistrut catalog tables, page 24). The design safety factor used in unistrut catalogs is .66Fy and .33 Fu. For BNL systems we would normally use .5 Fy and .25 Fu as a minimum. Therefore, to be conservative, we will derate the unistrut catalog allowable to 75%, making, for example, the allowable uniform load 900 lbs for a 96" channel. For a central point load on one channel the allowable load is derated by a factor of 2 to 450 lbs. Or, since the stress is inversely related to the beam length, we find the maximum length between simple supports for a beam to be 450/678.8 * 96 = 63.6 inches. Accordingly, we will provide columns to tie upper and lower cross beams between the end fixed columns to assure that the maximum unsupported length is less than 63.6 inches.

For Double unistrut (P1001) 84" long channels the maximum allowable column buckling load is 4970 (from unistrut catalog tables, assuming an eccentric load, page 25). Derating the table value as above, the maximum allowable buckling load for an 84" column becomes 3728. As this is well above our actual load and our maximum column height is less than 84 inches, the columns in the MMS platforms are all safe from buckling loads.

MMN Work Platforms

The logic for the analyses of the MMN work platforms is the same as for the MMS. Figures 3 and 4 illustrate the work platform design.

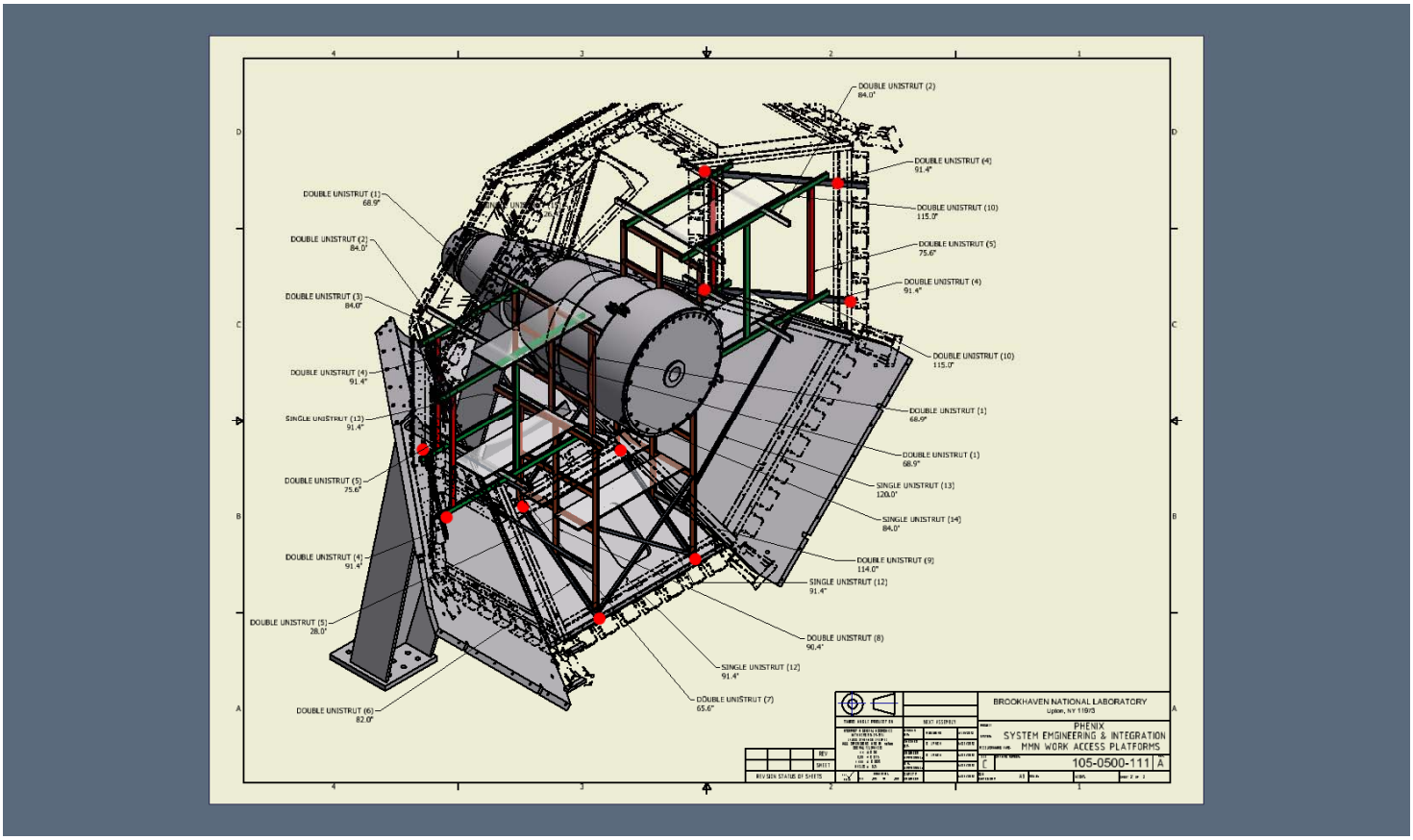
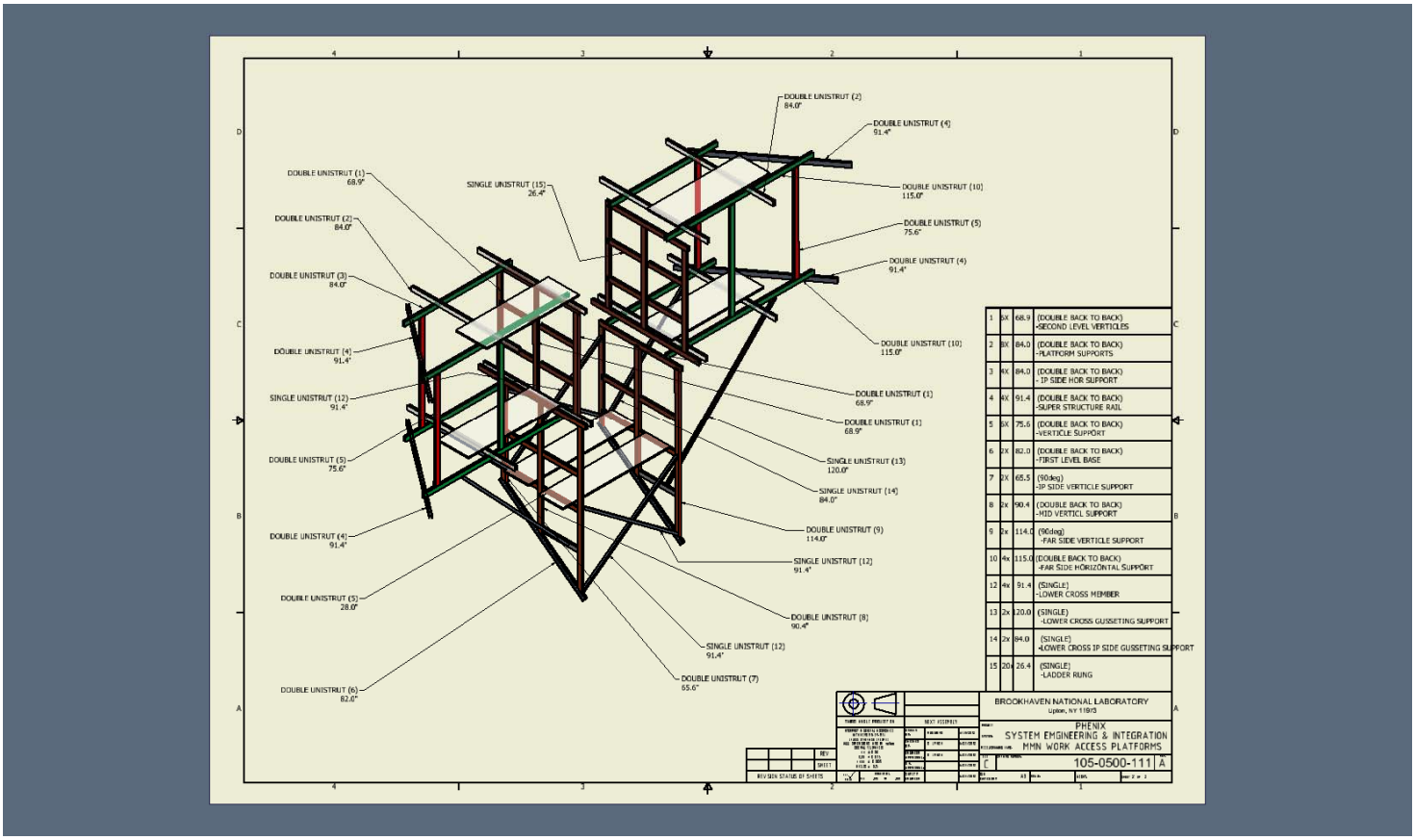


Figure 3: MMN Work Platfom with MMS shown



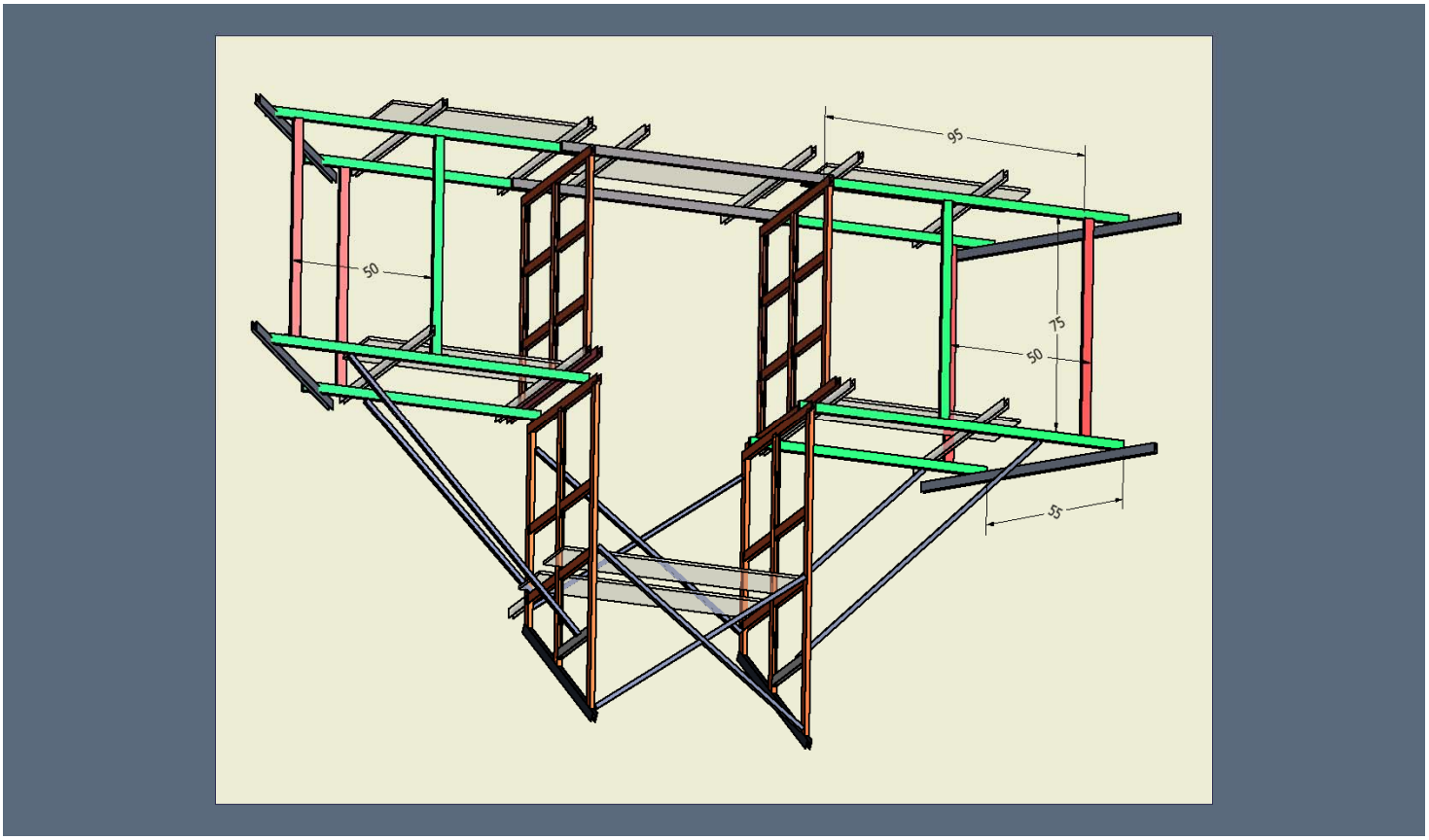


Figure 4: MMN Work Platfom with MMN hidden (circles are points of attachment to the MMN)

As the MMN is considerably larger than the MMS version, additional cross bracing, not included in the analysis has been added.

L_{hor}= the longest horizontal section of unistrut (double unistrut) is 115 inches.

L_{ver} = the longest vertical unsupported section ((double unistrut) is 111.5 inches.

The design load for horizontal members = (2 persons + platform + 115 in double unistrut at 3.8 lbs/ft) = (600 +50 + 54.6) = 704.6 lbs

The design load, vert. columns= (3 persons + 3 platforms + {3*68.9”+75.6”*2+82”+90.4”+65.6”+111.5”+9*84” in double unistrut @ 3.8 lbs/ft})= (900 + 150 + 463.4) = 1513.4 lbs

The analysis for the MMN cross beams is the same as for the MMS except that the full load top be applied is slightly greater resulting in a slightly shorter allowable maximum unsupported span: 450/704.6 * 96 = 61.3 inches. Accordingly, we will provide columns to tie upper and lower cross beams between the end fixed columns to assure that the maximum unsupported length is less than 61.3 inches.

For Double unistrut (P1001) 120” long channels the maximum allowable column buckling load is 3610 (from unistrut catalog tables, assuming an eccentric load, page 25). Derating the table value as above, the maximum allowable buckling load for an 120” column becomes 2707. As this is well above our actual load and our maximum column height is less than 120 inches, the columns in the MMN platforms are all safe from buckling loads.

Notes on configuring the work platforms

During the 2012 shutdown the station 2/3 work platforms will need to be reconfigured several times for the specific work to be performed as follows:

(a) Upper octants of MMN station 3 MuTr east of beam pipe, west of beampipe and above beampipe.

(b) Upper octants of MMN station 2 MuTr east of beam pipe, west of beampipe and above beampipe.

(c) Upper octants of MMS station 3 MuTr east of beam pipe, west of beampipe and above beampipe.

(d) Upper octants of MMS station 2 MuTr east of beam pipe, west of beampipe and above beampipe.

Attachments

Attachment 1: Selected pages from Unistrut Metal Framing General Engineering Catalog, North American Edition No. 12, Metal Framing Manufacturers Association, December 1997

UNISTRUT®
Metal Framing

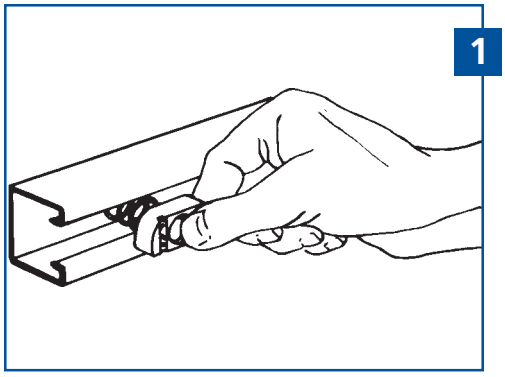
GENERAL ENGINEERING CATALOG

North American Edition
NO. 12

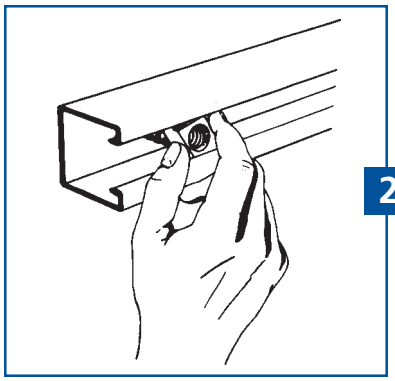
Featuring The Unique Weldless Connection

- Hex-head bolt connects fitting to channel as it is threaded into spring nut.
- Chamfer in nut eases starting of the bolt.
- Nut teeth create a strong, vise-like grip when tightened against the inturned channel edges.
- Channel edges and nut's tapered grooves act as guides to provide fool-proof alignment of connection.
- Nut teeth grip the channel's inturned edges, tying the channel sides together in a "box" configuration for added strength.
- Spring allows precision placement anywhere along channel length, then holds nut in position while connection is completed.

Strong, Fast, Economical and Adjustable

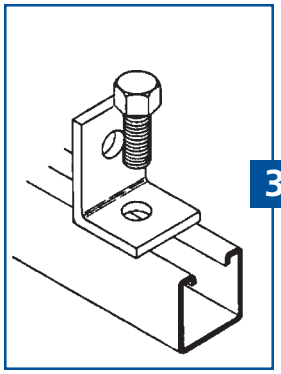


1 Insert the spring nut anywhere along the continuous slotted channel. The rounded nut ends permit easy insertion.

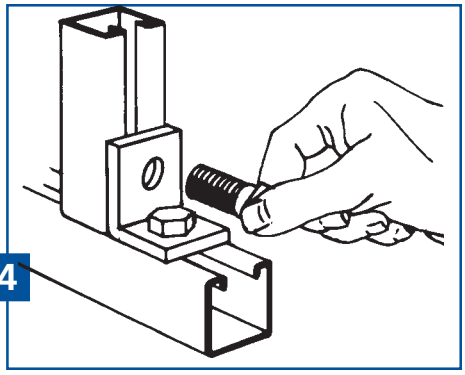


A 90° clockwise turn aligns the grooves in the nut with the inturned edges of the channel.

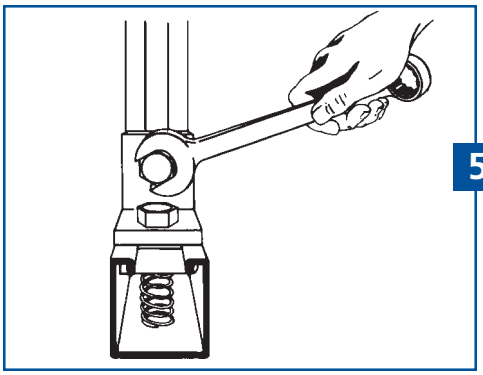
2 Fittings can be placed anywhere along the channel opening, permitting complete freedom of adjustment. The need for drilling holes is eliminated.



3 Insert bolt through fitting and into the spring nut. (See illustration 5 for end view showing nut in place)



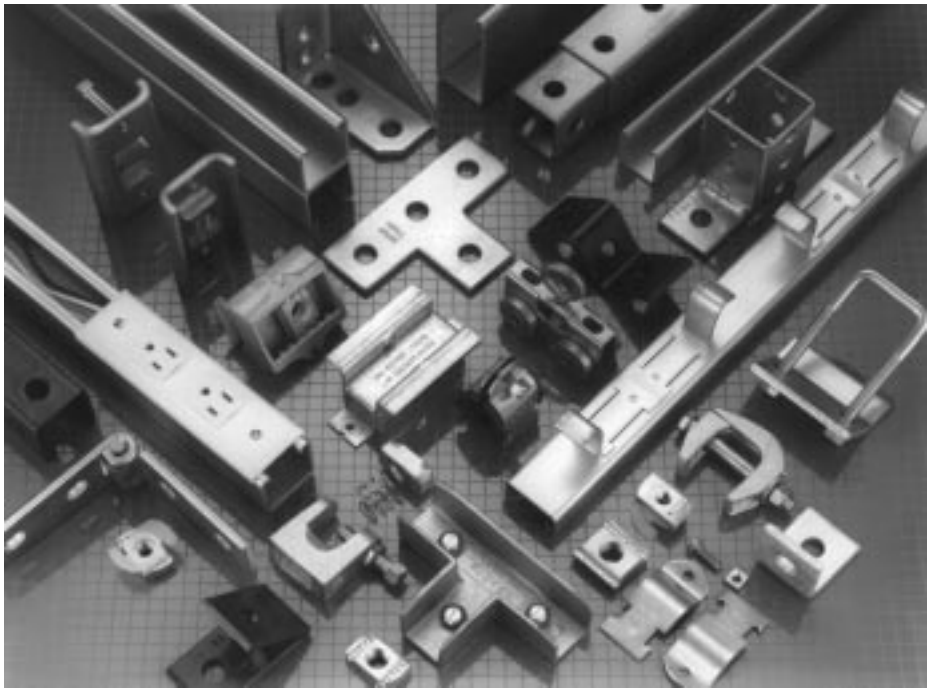
4 Additional channel sections can now be bolted to the fitting already in place by following procedure described in steps 1–3.



5 Tightening with a wrench locks the serrated teeth of the nut into the inturned edges of the channel, to complete a strong, vise-like connection.

Serving Design Professionals for Over 60 Years

Unistrut products have been helping to build a better world since 1924. Used extensively in nuclear, industrial and commercial construction markets for over 60 years, Unistrut Metal Framing has set the standard for product design, quality and performance. The initial Unistrut concept — a simple spring nut and bolt connecting a fitting to a continuous slotted channel — has evolved into a comprehensive engineered building and support system.

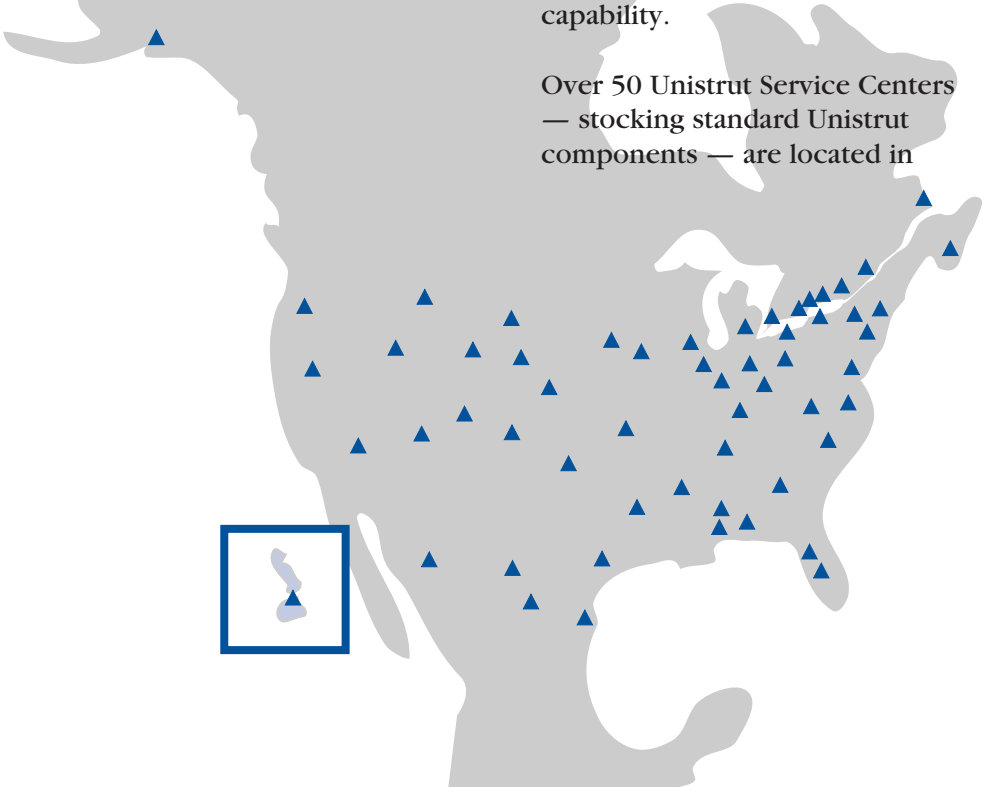


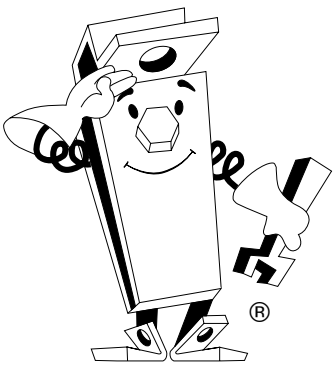
Unistrut — The Original Metal Framing System

There is only one Unistrut Metal Framing System. It incorporates the innovative product improvements that our research and development group has created to give you the most complete and flexible support system available. Backed by our worldwide network of engineering and distribution centers, Unistrut provides customers with total-resource capability.

Over 50 Unistrut Service Centers — stocking standard Unistrut components — are located in principal cities in North America to serve you quickly and directly. Many Service Centers are equipped to design and supply drawings for any type of metal framing application and also offer fabrication and installation services.

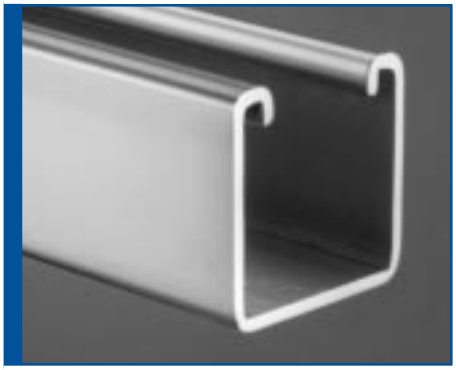
This catalog is a comprehensive presentation of Unistrut Metal Framing components plus technical data required by design, specification and construction professionals.

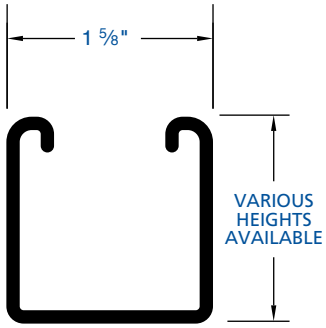




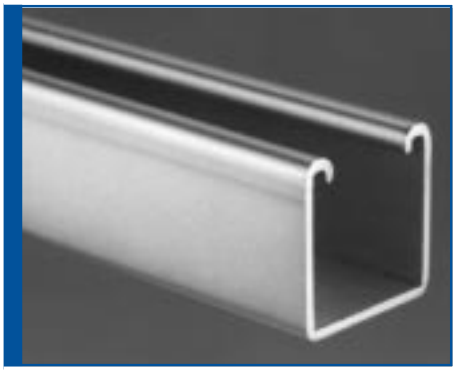
The Most Complete Metal Framing System — Offering Three Channel-Width Options

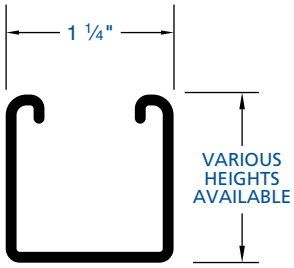
Adjustability, demountability and reusability are engineered into each of the three Unistrut channel series. Each series offers channels of varying depth and gage plus a complete line of fittings and accessories.



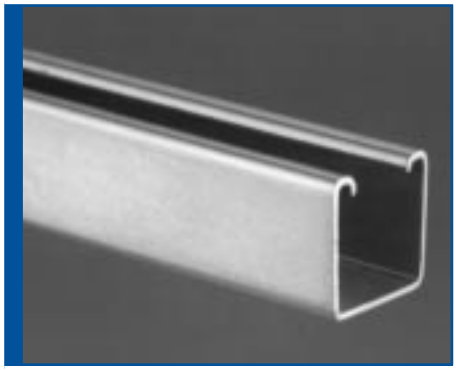


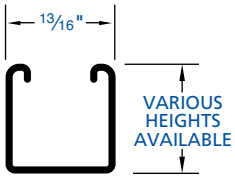
1⅝" width Series Channel begins on page 20.





1¼" width Series Channel begins on page 180.





13⁄16" width Series Channel begins on page 198.

1⅝" (41mm) width

Designed to carry the heaviest loads and provide the widest variety of applications, the 1⅝" series has become the accepted standard for use in mechanical, electrical and general construction applications where supports and attachments must meet the highest strength requirements.

1¼" (32mm) width

A framing system designed for medium loads, the 1¼" series is especially suitable for use in the OEM, commercial and display markets. It maintains a lightness in scale and a clean line that makes it aesthetically pleasing as well as functional.

13⁄16" (21mm) width

A unique half-size reduction of the 1⅝" channel-width series, this smaller channel size can be used to carry light loads economically in applications such as instrumentation, retail displays and light-duty laboratory supports. It also provides the flexibility found in all Unistrut framing systems.

Framing Members

Unistrut channels and continuous inserts are accurately and carefully cold-formed to size from low carbon strip steel. One side of the channel has a continuous slot with inturned edges. Secure attachments may be made to the framing member with the use of hardened, toothed, slotted nuts which engage the inturned edges.

Raw steel shall conform to the following ASTM specifications.

GAGE	FINISH	ASTM NO.
12	GR & HG	A570 GR 33
	PG	A653 GR 33
14	GR & HG	A570 GR 33
	PG	A653 GR 33
16	GR & HG	A366
	PG	A653 GR 33
19	GR	A366

Fittings

Unistrut fittings, unless noted otherwise, are punch-press made from hot rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635 or A36. The fitting steel also meets the physical requirement of ASTM A570 GR 33. The pickling of the steel produces a smooth surface free from scale.

Nuts and Bolts

Unistrut nuts are made from steel bars. After all machining operations are complete, they are thoroughly case hardened. Nuts are rectangular with ends shaped to permit a quarter turn clockwise in the framing member after insertion through the slotted opening in the channel. Two toothed grooves in the top of the nut engage the inturned edges of the channel and, after bolting operations are completed, will prevent any movement of the bolt and nut within the framing member. All bolts and nuts have Unified coarse screw threads. The standard framing nut is ½" and conforms to ASTM Specification A576 GR 1015 (material only). Screws conform to SAE J429 GR 2 (also meets and exceeds ASTM A307).

Finishes

PERMA-GREEN® II (GR)

Channel and parts are carefully cleaned and phosphated. Immediately after phosphating, a uniform coat of a highly effective rust-inhibiting acrylic enamel paint is applied by electro-deposition and thoroughly baked. Color is Perma-Green per Federal Standard 595a color number 14109 (dark limit V-). The resulting finish will withstand 400 hours of salt spray when tested in accordance with ASTM designation B-117.

ELECTRO-GALVANIZED (EG)

Parts, screws and nuts are coated with zinc electrolytically to commercial standards (ASTM - B633 Type III SC1).

PLAIN (PL)

Plain finish designation means that the channel retains the oiled surface applied to the raw steel during the rolling process. The fittings have the original oiled surface of the bar-stock material.

PRE-GALVANIZED (PG)

Material (steel strip) is coated with zinc by hot-dip process prior to roll-forming or press operations. The zinc coating weight is G90 conforming to ASTM Specification A653 GR 33.

HOT-DIPPED GALVANIZED (HG)

Material is coated with zinc after being roll-formed or after all manufacturing operations are completed, conforming to ASTM specification No. A123 or A153.

SPECIAL COATING

When specific applications require other than standard available finishes, special finishes can be supplied per customer requirements.

WEIGHTS AND DIMENSIONS

Weights given for all materials are approximate shipping weights. All dimensions subject to commercial tolerance within published specifications.

WE RESERVE THE RIGHT TO MAKE SPECIFICATION CHANGES WITHOUT NOTICE .

WHILE EVERY EFFORT HAS BEEN MADE TO ASSURE THE ACCURACY OF INFORMATION CONTAINED IN THIS CATALOG AT THE TIME OF PUBLICATION, WE CANNOT ACCEPT RESPONSIBILITY FOR INACCURACIES RESULTING FROM UNDETECTED ERRORS OR OMISSIONS.

THE BLUE COLOR USED ON UNISTRUT COMPONENTS ILLUSTRATED IN THIS CATALOG IS FOR GRAPHIC ENHANCEMENT ONLY, AND DOES NOT REPRESENT ACTUAL PRODUCT COLOR.

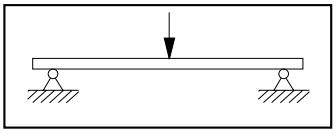
A) BEAMS

Beams are structural members loaded at right angles (perpendicular) to their length. Most beams are horizontal and subjected to gravity or vertical loads, e.g. a shelf support. However a vertical member can act as a beam under certain conditions, such as a curtain wall mullion subjected to wind loading. The bending moment developed in a beam is dependent on

(a) the amount of load applied,
(b) the type of loading applied, and
(c) the support conditions.

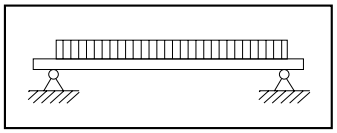
1) Types of Beam Loading

a) Point Load



A load concentrated onto a very small length of the beam is a point load.

b) Uniform Load

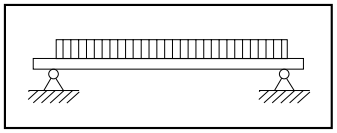


A load spread evenly over a relatively long length of the beam is a uniform load.

Point and uniform loads can be placed on a beam in any combination. A series of point loads can approximate a uniform loading. The load charts and tables are based on a uniform load unless identified otherwise.

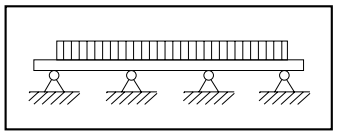
2) Support conditions

a) Simple Beam



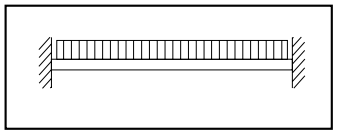
A simple beam has supports that prevent movement left and right, or up and down, but do not restrain the beam from rotating at the supports into a natural deflected curve. Most Unistrut Metal Framing connections produce simple beams. The load charts and tables are based on simple beams unless identified otherwise.

b) Continuous Beam



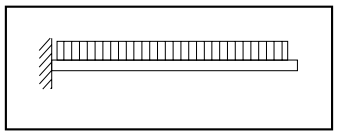
Any simple beam that is supported at one or more intermediate points is a continuous beam. A mezzanine joist that passes over three or more columns is an example of a continuous beam.

c) Fixed-End Beam



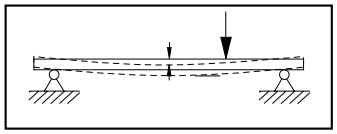
Supports that prevent the beam from rotating into a natural deflected curve, produce a fixed-end beam. A welded end connection to very rigid support produces a fixed-end beam.

d) Cantilever Beam



A cantilever beam is a fixed-end beam that is supported at one end only, while the other end is unsupported. Unistrut brackets are examples of cantilever beams.

3) Deflection



All beams deflect under load. The amount of deflection is dependent on

(a) the amount of load,
(b) the support conditions,
(c) the stiffness of the beam's cross-sectional shape, and
(d) the stiffness of the beam material.

The stiffness of the beam's cross-sectional shape is measured by its "Moment Of Inertia" or "I". The larger a beam's "I", the stiffer it is and the less it will deflect. A beam's "I" can change for each major axis. The "I" of both major axes (I 1-1 and I 2-2) are provided. The stiffness of a beam's material is measured by its "Modulus of Elasticity" or "E". The larger a material's "E", the stiffer it is and the less it deflects. For example, steel is about three times stiffer than aluminum and as a result, deflects only one-third as much. Do not confuse stiffness with strength. Two materials may have identical strengths yet still have different "E's". A high-strength aluminum may be as strong as steel and still deflect three times as much. The load charts and tables give calculated deflections for the loads shown. In many cases, a final design will be determined by the maximum deflection, not the maximum load.

4) Bending Moment

Is it strong enough? This is the final consideration for any beam. A beam must not only hold up the anticipated loads, but must also have sufficient additional capacity to safely hold unforeseen variations in applied loads and material strengths. This additional capacity is called a safety factor and is usually regulated by the various design codes and standards. A beam's strength is usually measured by an allowable bending moment or an allowable stress. The traditional approach is the allowable stress method, where a beam is determined to have a maximum allowable stress (in pounds per square inch) which is not to be exceeded. The approach of the current AISI "Specification For The Design Of Cold-Formed Steel Structural Members" is to use a maximum allowable bending moment (in inch-pounds) which is not to be exceeded. Bending moment divided by a beam's section modulus or "S" equals stress.

B) COLUMNS

Columns are structural members that are loaded parallel to their length. Most columns are vertical and are used to carry loads from a higher level to a lower level. However any member subjected to compression loads, such as a diagonal or prop brace, is a column.

A column fails by "buckling", which is a sudden loss of straightness and subsequent collapse. Allowable column load is dependent on

(a) the length of column,
(b) the type of loading,
(c) the support conditions, and
(d) the column's cross-sectional shape and material.

1) Column Length

The column length is measured from braced point to braced point. A braced point is where the column is restrained from lateral movement (translation) in all directions.

2) Types Of Column Loading

a) Concentric Loading

Loads applied to the center of gravity of the column cross-section are considered concentric. A beam that passes over and rests on the top of a column is an example of concentric loading.

b) Eccentric Loading

Any load which is not concentric is eccentric. The amount of eccentricity (in inches) has a major effect on the load-carrying capacity of any particular column. A load that is transmitted to a Unistrut Metal Framing column using a standard fitting bolted to the slot face is considered eccentric.

The load tables give allowable loads for both concentric (loaded at C.G.) and certain eccentric (loaded at slot face) loading. Allowable loads for other eccentric loading must be determined by a qualified design professional.

3) Support Conditions

Based on the support conditions, an appropriate "K" value is selected. This "K" value, which mathematically describes the column end conditions, is used in the column design equations. The most common support condition combinations are as follows:

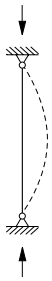
a) Fixed Top – Fixed Bottom

Both ends are restrained against rotation and lateral movement (translation). K equals .65.

b) Pinned Top – Fixed Bottom

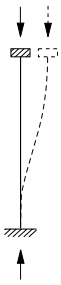
The top is restrained against lateral movement (translation) but, is allowed to rotate. The bottom is restrained against rotation and lateral movement. This is a common support condition and is used to construct the allowable column load applied at the Slot Face tables. "K" equals .80.

c) Pinned Top – Pinned Bottom



Both ends are restrained against lateral movement (translation) but, are allowed to rotate. "K" equals 1.0.

d) Fixed / Free Top – Fixed Bottom



The top is restrained against rotation but is allowed to move laterally. The bottom is restrained against rotation and lateral movement (translation). "K" equals 1.2.

4) Cross-Sectional Shape

The cross-sectional shape of a column member determines the value of it's "Radius of Gyration" or "r". In general, a member with a large "r" makes a better column than a member with a small "r". Each axis of a column has a different "r". Typically the axis with the smallest "r" determines the final design.

C) BOLT TORQUE

Bolt torque values are given to ensure the proper connection between Unistrut Metal Framing components. It is important to understand that there is a direct, but not necessarily consistent, relationship between bolt torque and tension in the bolt. Too much tension in the bolt can cause it to break or crush the component parts. Too little tension in the bolt can prevent the connection from developing its full load capacity. The torque values given have been developed over many years of experience and testing.

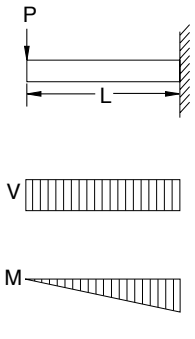
BOLT SIZE	¼" 20	5⁄16" 18	⅜" 16	½" 13	⅝" 11	¾" 10
FOOT LBS.	6	11	19	50	100	125
N·m	8	15	25	70	135	170

These are based on using a properly calibrated torque wrench with a clean dry (non-lubricated) Unistrut fitting, bolt and nut. A lubricated bolt or nut can cause extremely high tension in the connection and may lead to bolt failure. It must be noted that the accuracy of commercial torque wrenches varies widely and it is the responsibility of the installer to ensure that proper bolt torque has been achieved.

CONVERSION FACTORS

To Convert From	To	Multiply By	To Convert From	Multiply To	By
Length					
Inch [in]	Millimeter [mm]	25.400 000	Millimeter [mm]	Inch [in]	0.039 370
Foot [ft]	Meter [m]	0.304 800	Meter [m]	Foot [ft]	3.280 840
Yard [yd]	Meter [m]	0.914 400	Meter [m]	Yard [yd]	1.093 613
Mile (U.S. Statute) [mi]	Kilometer [km]	1.609 347	Kilometer [km]	Mile (U.S. Statute) [mi]	0.621 370
Area					
Square Inch [in^2]	Square Millimeter [mm^2]	645.16	Square Millimeter [mm^2]	Square Inch [in^2]	0.001550
Square Foot [ft^2]	Square Meter [m^2]	0.092 903	Square Meter [m^2]	Square Foot [ft^2]	10.763 915
Square Yard [yd^2]	Sqare Meter [m^2]	0.836 127	Sqare Meter [m^2]	Square Yard [yd^2]	1.195 991
Square Mile [mi^2] (U.S. Statute)	Square Kilometer [km^2]	2.589 998	Square Kilometer [km2]	Square Mile [mi^2] (U.S. Statute)	0.386 101
Acre	Square Meter [m^2]	4046.873	Square Meter [m^2]	Acre	0.000 247
Acre	Hectare	0.404 687	Hectare	Acre	2.471 046
Volume					
Cubic Inch [in^3]	Cubic Millimeter [mm^3]	16387.06	Cubic Millimeter [mm^3]	Cubic Inch [in^3]	0.000061
Cubic Foot [ft^3]	Cubic Meter [m^3]	0.028 317	Cubic Meter [m^3]	Cubic Foot [ft^3]	35.314 662
Cubic Yard [yd^3]	Cubic Meter [m^3]	0.764 555	Cubic Meter [m^3]	Cubic Yard [yd^3]	1.307 950
Gallon (U.S. Liquid) [gal]	Litre [l]	3.785 412	Litre [l]	Gallon (U.S. Liquid) [gal]	0.264 172
Quart (U.S. Liquid) [qt]	Litre [l]	0.946 353	Litre [l]	Quart (U.S. Liquid) [qt]	1.056 688
Mass					
Ounce (Avoirdupois) [oz]	Gram [g]	28.349 520	Gram [g]	Ounce (Avoirdupois) [oz]	0.035 274
Pound (Avoirdupois) [lb]	Kilogram [kg]	0.453 592	Kilogram [kg]	Pound (Avoirdupois) [lb]	2.204 624
Short Ton	Kilogram [kg]	907.185	Kilogram [kg]	Short Ton	0.00110
Force					
Ounce-Force	Newton [N]	0.278 014	Newton [N]	Ounce-Force	3.596 941
Pound-Force [lbf]	Newton [N]	4.448 222	Newton [N]	Pound-Force [lbf]	0.224 809
Bending Moment					
Pound-Force-Inch [lbf-in]	Netwon-Meter [N-m]	0.112 985	Netwon-Meter [N-m]	Pound-Force-Inch [lbf-in]	8.850 732
Pound-Force-Foot [lbf-ft]	Newton-Meter [N-m]	1.355 818	Newton-Meter [N-m]	Pound-Force-Foot [lbf-ft]	0.737 562
Pressure, Stress					
Pound-Force per Square Inch [lbf/in^2]	Kilopascal [kPa]	6.894 757	Kilopascal [kPa]	Pound-Force per Square Inch [lbf/in^2]	0.145 038
Foot of Water (39.2 F)	Kilopascal [kPa]	2.988 980	Kilopascal [kPa]	Foot of Water (39.2 F)	0.334 562
Inch of Mercury (32 F)	Kilopascal [kPa]	3.386 380	Kilopascal [kPa]	Inch of Mercury (32 F)	0.295 301
Energy, Work, Heat					
Foot-Pound-Force [ft-lbf]	Joule [J]	1.355 818	Joule [J]	Foot-Pound-Force [ft-lbf]	0.737 562
British Thermal Unit [Btu]	Joule [J]	1055.056	Joule [J]	British Thermal Unit [Btu]	0.000948
Calorie [cal]	Joule [J]	4.186 800	Joule [J]	Calorie [cal]	0.238 846
Kilowatt Hour [kW-h]	Joule [J]	3600000	Joule [J]	Kilowatt Hour [kW-h]	2.78^{-7}
Power					
Foot-Pound-Force /Second [ft-lbs/s]	Watt [W]	1.355 818	Watt [W]	Foot-Pound-Force /Second [ft-lbs/s]	0.737 562
British Thermal Unit /Hour [Btu/h]	Watt [W]	0.293 071	Watt [W]	British Thermal Unit /Hour [Btu/h]	3.412 142
Horsepower (550 Ft. Lbf/s) [hp]	Kilowatt [kW]	0.745 700	Kilowatt [kW]	Horsepower (550 Ft. Lbf/s) [hp]	1.341 022
Angle					
Degree	Radian [rad]	0.017 453	Radian [rad]	Degree	57.295 788
Temperature					
Degree Fahrenheit [F]	Degree Celsius [C]	(F° -32)/1.8	Degree Celsius [C]	Degree Fahrenheit [F]	1.8xC°+32

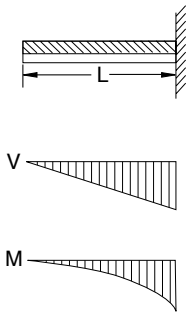
CANTILEVER BEAMS



$V_{max.} = P$

$M_{max.} = PL$

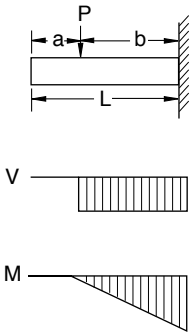
$\Delta_{max.} = \frac{PL^3}{3EI}$



$V_{max.} = W$

$M_{max.} = \frac{WL}{2}$

$\Delta_{max.} = \frac{WL^3}{8EI}$

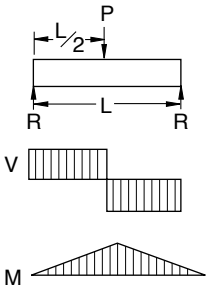


$V_{max.} = P$

$M_{max.} = Pb$

$\Delta_{max.} = \frac{Pb^2(3L-b)}{6EI}$

SIMPLE BEAMS

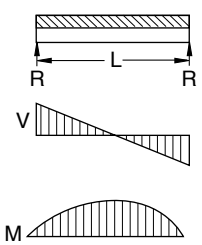


$R = \frac{P}{2}$

$V_{max.} = \frac{P}{2}$

$M_{max.} = \frac{PL}{4}$

$\Delta_{max.} = \frac{PL^3}{48EI}$

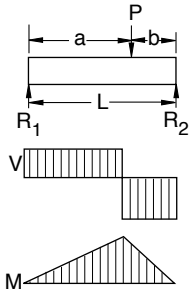


$R = \frac{W}{2}$

$V_{max.} = \frac{W}{2}$

$M_{max.} = \frac{WL}{8}$

$\Delta_{max.} = \frac{5WL^3}{384EI}$



$R_1 = \frac{Pb}{L}$

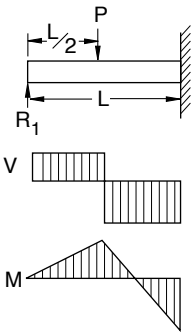
$R_2 = \frac{Pa}{L}$

$V_{max.} = \frac{Pa}{L}$

$M_{max.} = \frac{Pab}{L}$

$\Delta_{max.} = \frac{Pab(a+2b)\sqrt{3a(a+2b)}}{27EIL}$

BEAMS FIXED AT ONE END, SUPPORTED AT OTHER



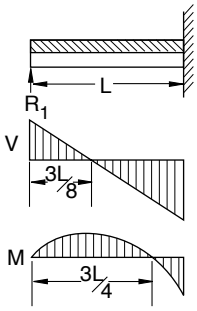
$R_1 = \frac{5P}{16}$

$V_{max.} = \frac{11P}{16}$

$M_{max.} = \frac{3PL}{16}$

$\Delta_{max.}$ at $x = 0.447L$

$\Delta_{max.} = 0.009317\frac{PL^3}{EI}$



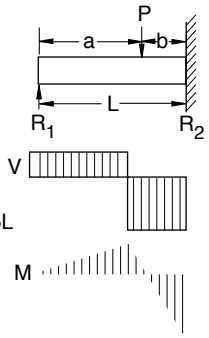
$R_1 = \frac{3W}{8}$

$V_{max.} = \frac{5W}{8}$

$M_{max.} = \frac{WL}{8}$

$\Delta_{max.}$ at $x = 0.4215L$

$\Delta_{max.} = \frac{WL^3}{185EI}$



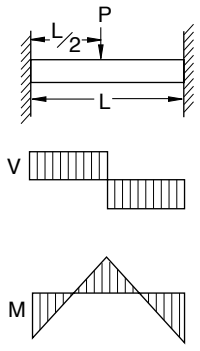
$R_1 = \frac{Pb^2}{2L^3}(a+2L)$

$R_2 = \frac{Pa}{2L^3}(3L^2-a^2)$

M at point of load $= R_1 a$

M at fixed end $= \frac{Pab}{2L^3}(a+L)$

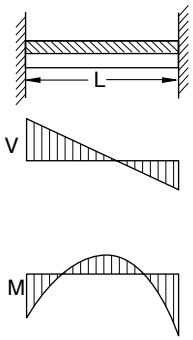
BEAMS FIXED AT BOTH ENDS



$V_{max.} = \frac{P}{2}$

$M_{max.} = \frac{PL}{8}$

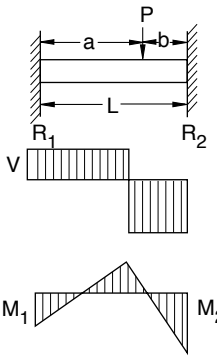
$\Delta_{max.} = \frac{PL^3}{192EI}$



$V_{max.} = \frac{W}{2}$

$M_{max.} = \frac{WL}{12}$

$\Delta_{max.} = \frac{WL^3}{384EI}$



$R_1 = \frac{Pb^2}{L^3}(3a+b)$

$R_2 = \frac{Pa^2}{L^3}(a+3b)$

$M_1 = \frac{Pab^2}{L^2}$

$M_2 = \frac{Pa^2b}{L^2}$

R – Reaction
M – Moment
P – Concentrated Load

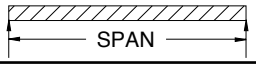
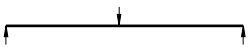
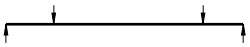
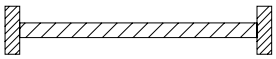
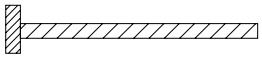
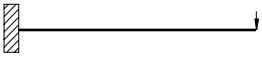
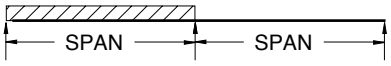
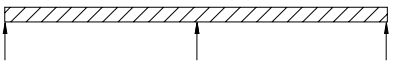
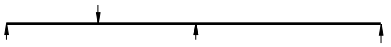
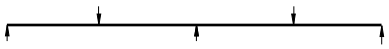
W – Total Uniform Load
V – Shear
L – Length

Δ – Deflection
E – Modulus of Elasticity
I – Moment of Inertia

CONVERSION FACTORS FOR BEAMS WITH VARIOUS STATIC LOADING CONDITIONS

All Beam Load tables are for single-span (simple) beams supported at the ends. These can be used in the majority of the cases.

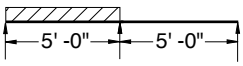
There are times when it is necessary to know what happens with other loading and support conditions. Some common arrangements are shown below. Simply multiply the values from the Beam Load tables by factors given below

LOAD AND SUPPORT CONDITION	LOAD FACTOR	DEFLECTION FACTOR
1. Simple Beam, Uniform Load 	1.00	1.00
2. Simple Beam, Concentrated Load at Center 	.50	.80
3. Simple Beam, Two Equal Concentrated Loadcs at 1/4 pts 	1.00	1.10
4. Beam Fixed at Both Ends, Uniform Load 	1.50	.30
5. Beam Fixed at Both Ends, Concentrated Load at Center 	1.00	.40
6. Cantilever Beam, Uniform Load 	.25	2.40
7. Cantilever Beam, Concentrated Load at End 	.12	3.20
8. Continuous Beam, Two Equal Spans, Uniform Load on One Span 	1.30	.92
9. Continuous Beam, Two Equal Spans, Uniform Load on Both Ends 	1.00	.42
10. Continuous Beam, Two Equal Spans, Concentrated Load at Center of One Span 	.62	.71
11. Continuous Beam, Two Equal Spans, Concentrated Load at Center of Each Span 	.67	.48

EXAMPLE I

PROBLEM:

Determine load and deflection of a P 1000 beam continuous over one support and loaded uniformly on one span.



SOLUTION:

A. From load table for P1000 on page 24 load for a 5'-0" span is 680# and deflection is .35".
B. Multiply by factors from Table above.
   Load = 680# x 1.30 = 884#
   Deflection = .35" x .92 = .32"

EXAMPLE II

PROBLEM:

Determine load and deflection of a P 5500 cantilever beam with a concentrated load on the end.

SOLUTION:

A. From load table P5500 on page 57 load for a 3'-0" span is 2190# and deflection is .09".
B. Multiply by factors from Table above.
   Load = 2190# x .12 = 263#
   Deflection = .09" x 3.20 = .29"

PART I - GENERAL

1.01 SCOPE OF WORK

A. Provide all Unistut Metal Framing material, fittings and related accessories (Strut System) as indicated on the Contract Drawings.
B. Provide all labor, supervision, engineering, and fabrication required for installation of the Strut System in accordance with the Contract Drawings and as specified herein.
C. Related work specified elsewhere.

1.02 QUALITY ASSURANCE

A. Manufacturer's qualifications:
   1. The manufacturer shall not have had less than 10 year's experience in manufacturing Strut Systems.
   2. The manufacturer must certify in writing all components supplied have been produced in accordance with an established quality assurance program.
B. Installer's qualifications:
   1. Installer must be a Unistrut trained manufacturer's authorized representative/installer with not less than 5 years experience in the installation of Strut Systems of this size and conformation.
   2. All Strut System components must be supplied by a single manufacturer.
C. Standards:
   1. Work shall meet the requirements of the following standards.

      Federal, State and Local codes.
      American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members August 19, 1986 Edition, December 11, 1989 Addendum.

      American Society for Testing And Materials (ASTM).

1.03 SUBMITTALS

A. Structural Calculations and Shop Drawings
   1. Submit structural calculations for approval by the project engineer. Calculations may include, but are not limited to:
      a. Description of design criteria.
      b. Stress and deflection analysis.
      c. Selection of Unistrut framing members, fittings, and accessories.
   2. Submit all shop/assembly drawings necessary to completely install the Strut System in compliance with the Contract Drawings.
   3. Submit all pertinent manufacturers published data.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All material is to be delivered to the work site in original factory packaging to avoid damage to the finish.
B. Upon delivery to the work site, all components shall be protected from the elements by a shelter or other covering.

1.05 GUARANTEE

A. Separate guarantees shall be issued from the erector and manufacturer, valid for a period of 1 year, against any defects that may arise from the installation or manufacture of the Strut System components.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All Strut System components shall be as manufactured by UNISTRUT CORPORATION or approved equal as determined by the Architect or Engineer of record in writing 10 days prior to bid date.

2.02 MATERIALS

A. All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications:
   A 570 GR 33, A 653 GR 33
B. All fittings shall be fabricated from steel conforming to one of the following ASTM specifications:
   A 575, A 576, A 36 or A 635
C. Substitutions
   Any substitutions of product or manufacturer must be approved in writing ten days prior to bid date, by Architect or Engineer of record.

2.03 FINISHES

A. Strut System components shall be finished in accordance with one of the following standards:

   1. PERMA-GREEN® II (GR)
      Rust inhibiting acrylic enamel paint applied by electro-deposition, after cleaning and phosphating, and thoroughly baked. Color is per Federal Standard 595a color number 14109 (dark limit V-). Finish to withstand minimum 400 hours salt spray when tested in accordance with ASTM B 117.

   2. ELECTRO-GALVANIZED (EG)
      Electrolytically zinc coated per ASTM B 633 Type III SC 1

   3. PRE-GALVANIZED (PG)
      Zinc coated by hot-dipped process prior to roll forming. The zinc weight shall be G90 conforming to ASTM A 653.

   4. HOT-DIPPED GALVANIZED (HG)
      Zinc coated after all manufacturing operations are complete. Coating shall conform to ASTM A 123 or A 153.

   5. SPECIAL COATING / MATERIAL
      (Describe as applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

A. The installer shall inspect the work area prior to installation. If work area conditions are unsatisfactory, installation shall not proceed until satisfactory corrections are completed.

3.02 INSTALLATION

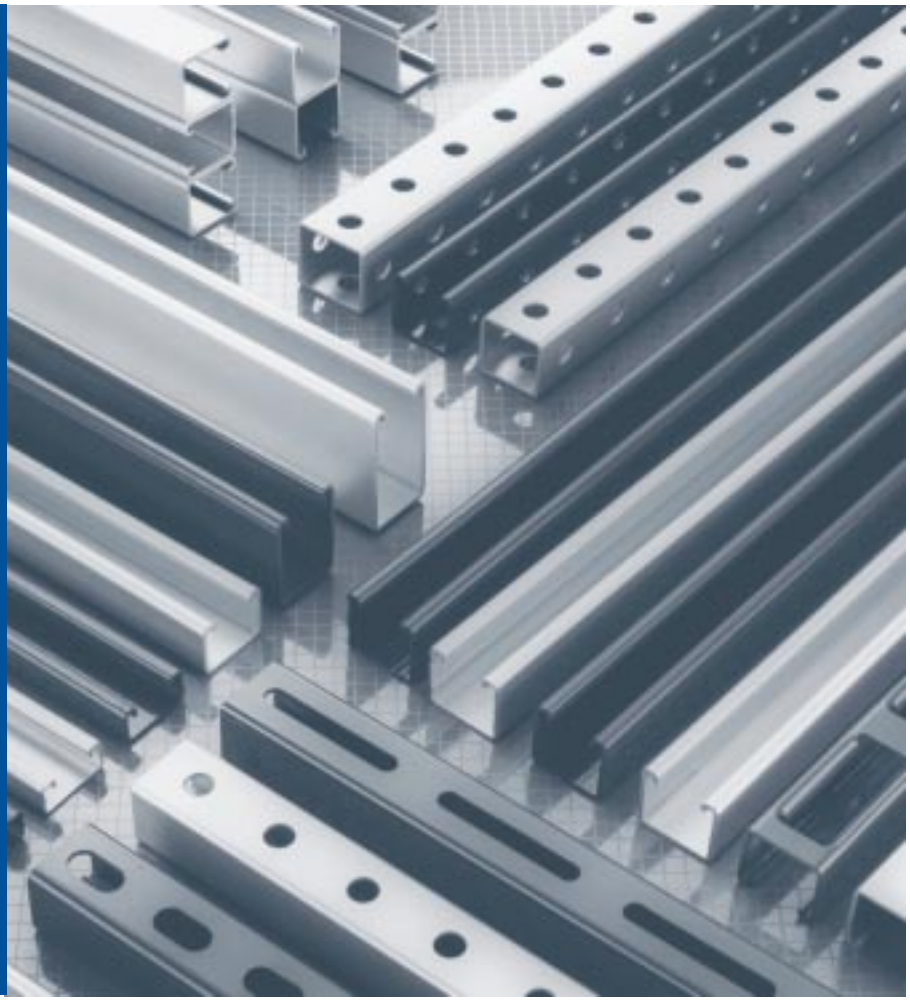
A. Installation shall be accomplished by a fully trained manufacturer authorized installer.
B. Set Strut System components into final position true to line, level and plumb, in accordance with approved shop drawings.
C. Anchor material firmly in place. Tighten all connections to their recommended torques.

3.03 CLEANUP

A. Upon completion of this section of work, remove all protective wraps and debris. Repair any damage due to installation of this section of work.

3.04 PROTECTION

A. During installation, it shall be the responsibility of the installer to protect this work from damage.
B. Upon completion of this scope of work, it shall become the responsibility of the general contractor to protect this work from damage during the remainder of construction on the project and until substantial completion.



MATERIAL
Unistrut channels are accurately and carefully cold formed to size from low-carbon strip steel.

Spot-welded combination members are welded 3" (maximum) on center.

STEEL: PLAIN
12 Ga. (2.7 mm), 14 Ga.(1.9 mm) ASTM A570 GR 33
16 Ga. (1.5 mm) ASTM A366

STEEL: PRE-GALVANIZED
12 Ga. (2.7 mm), 14 Ga. (1.9 mm) and 16 Ga. (1.5mm) ASTM A653 GR 33

For other materials, see Special Metals and Fiberglass section.

FINISHES
All channels are available in: Perma Green II (GR), pre-galvanized (PG), conforming to ASTM A653; Hot-dipped galvanized (HG), conforming to ASTM A123 or A153; and plain (PL).

STANDARD LENGTHS
Standard lengths are 10 feet (3.05m) and 20 feet (6.10m). Tolerances are +⅛" (3.2 mm) to +½" (12.7 mm) to allow for cutting. Special lengths are available for a small cutting charge with a tolerance of ±⅛" (3.2mm).

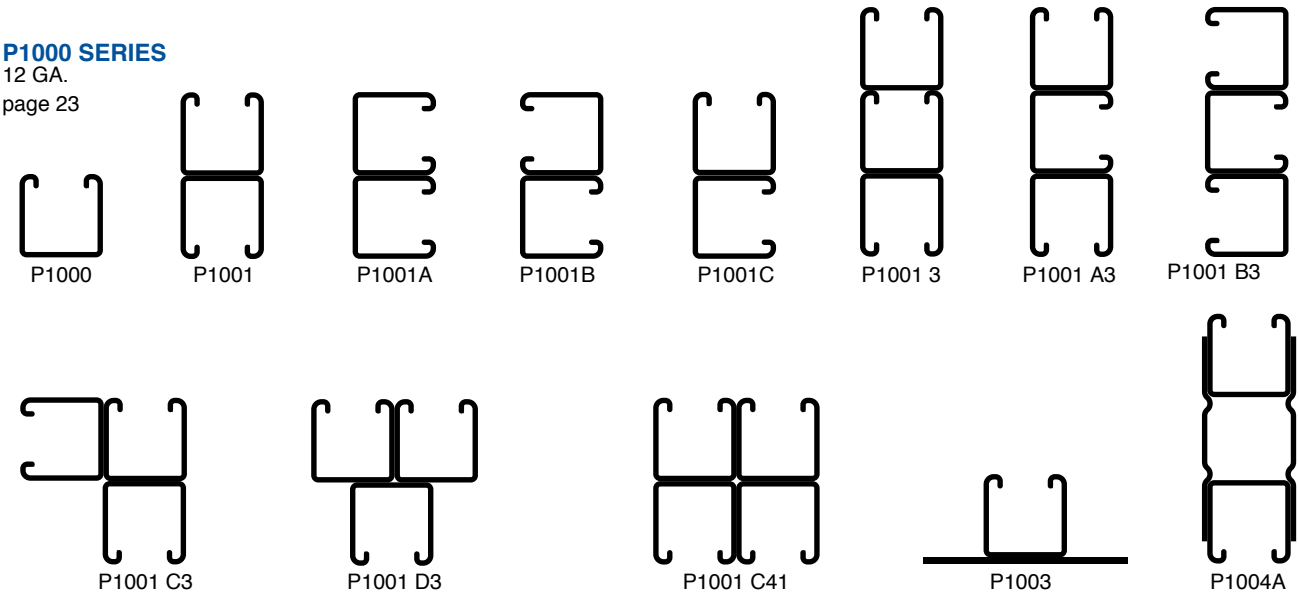
CURVED CHANNEL
Many Unistrut 1⅝" (41mm) channel sections are available as curved pieces in both single and combination styles. Contact your local Unistrut Service Center or Unistrut Corporation for ordering information.

DIMENSIONS
Imperial dimensions are illustrated in inches. Metric dimensions are shown in millimeters and rounded to one decimal place.

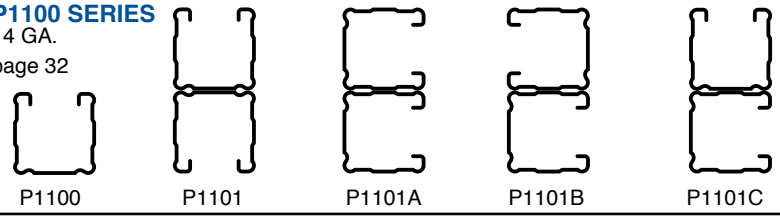
LOAD DATA
All beam and column load data pertains to carbon steel and stainless steel channels. Load tables and charts are constructed to be in accordance with the SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS AUGUST 19, 1986 EDITION with DECEMBER 11, 1989 ADDENDUM published by the AMERICAN IRON AND STEEL INSTITUTE.

CHANNELS & COMBINATIONS
FOR 1⅝" (41 MM) WIDTH SERIES CHANNEL

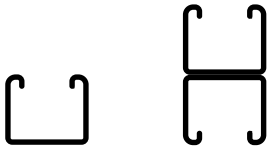
P1000 SERIES
12 GA.
page 23



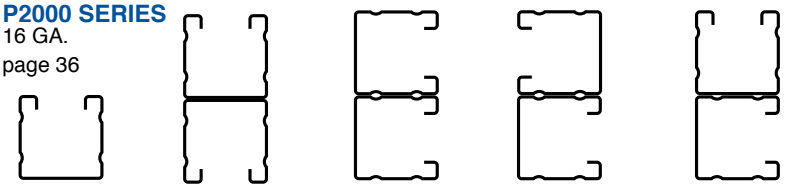
P1100 SERIES
14 GA.
page 32



P3000 SERIES
12 GA.
page 40

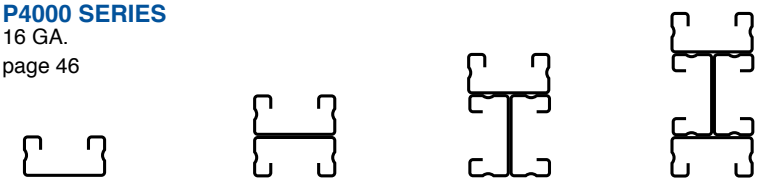


P2000 SERIES
16 GA.
page 36



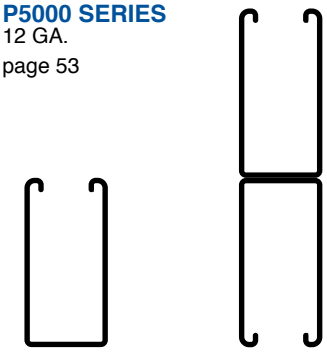
P3300 SERIES
12 GA.
page 43

P4000 SERIES
16 GA.
page 46

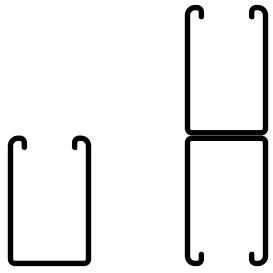


P4100 SERIES
14 GA.
page 50

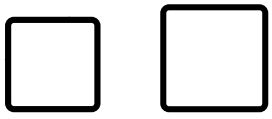
P5000 SERIES
12 GA.
page 53



P5500 SERIES
12 GA.
page 56



P9000 SERIES
12 GA.
page 62



See page 180 for 1-¼" width channels and combinations and page 198 for 13/16" channels and combinations.

Combinations not shown in catalog are available on special order. Consult factory for details.

CHANNEL SELECTION CHART

Channel	Channel Dimensions				Material & Thickness			Hole Pattern Styles					
	Width		Height					KO	T	SL	HS	DS	H3
	In	mm	In	mm	Steel	Stain-less Steel	Alum.						
P1000	1⅝	41	1⅝	41	12 ga	12 ga	.109	■	■	■	■	■ *	■ *
P1100	1⅝	41	1⅝	41	14 ga	14 ga	—	■	■	■	■		
P2000	1⅝	41	1⅝	41	16 ga	—	—	■	■	■	■		
P3000	1⅝	41	1⅜	35	12 ga	—	—	■	■	■	■		
P3300	1⅝	41	⅞	22	12 ga	12 ga	—		■	■	■		
P4000	1⅝	41	13/16	21	16 ga	16 ga	.078		■	■	■		
P4100	1⅝	41	13/16	21	14 ga	—	—		■	■	■		
P5000	1⅝	41	3¼	83	12 ga	—	—	■	■	■	■		
P5500	1⅝	41	2 7/16	62	12 ga	—	.109	■	■	■	■		

- This reference chart reflects the available channels and hole patterns manufactured by Unistrut Corporation.
- Stainless steel sections are also available on special order in "T," "SL" and "HS" hole pattern.
- Metric equivalent for material thickness: 12 ga. (2.7 mm); 14 ga. (1.9 mm); and 16 ga. (1.5 mm).

* Not available in aluminum.

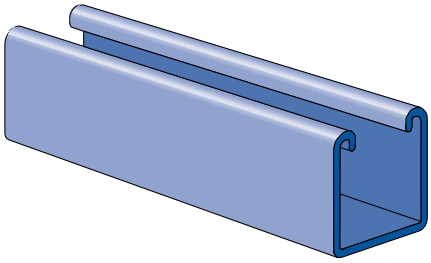
CHANNELS & COMBINATIONS IN DESCENDING ORDER OF STRENGTH

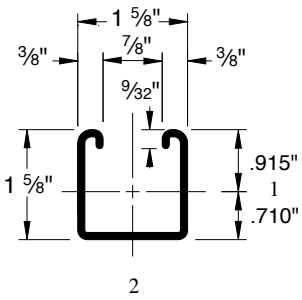
Channel	S in³	I in⁴	Area in²	Weight Lbs/Ft
P5001	1.716*	5.578*	1.794	6.10
P1004 A	1.673	4.079	1.978	6.70
P5501	1.153	2.811	1.453	4.94
P1001 C41	1.145	1.860	2.223	7.60
P5000	.628	1.099	.897	3.05
P1001	.572	.930	1.112	3.80
P1101	.456	.741	.834	2.84
P3001	.431	.593	1.007	3.40
P5500	.391	.523	.726	2.47
P2001	.379	.616	.681	2.32
P9200	.297	.278	.489	2.23

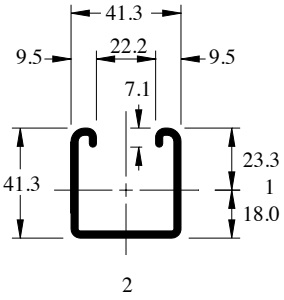
Channel	S in³	I in⁴	Area in²	Weight Lbs/Ft
P9000	.203	.164	.384	2.05
P3301	.202	.177	.797	2.70
P1000	.202	.185	.556	1.90
P1100	.166	.149	.417	1.42
P3000	.154	.121	.503	1.70
P4101	.141	.114	.574	1.94
P2000	.140	.124	.340	1.16
P4001	.125	.101	.478	1.64
P3300	.072	.037	.398	1.35
P4100	.053	.025	.287	.97
P4000	.048	.023	.239	.82

* Effective section properties.

P1000



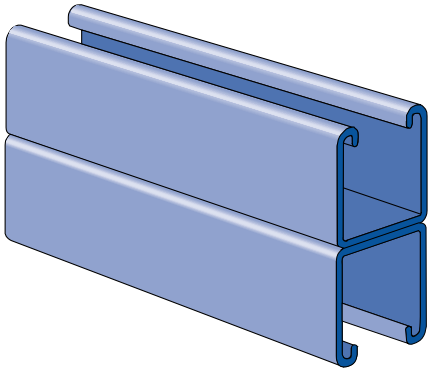


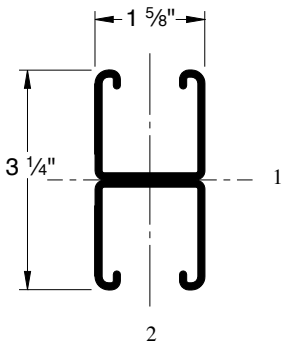


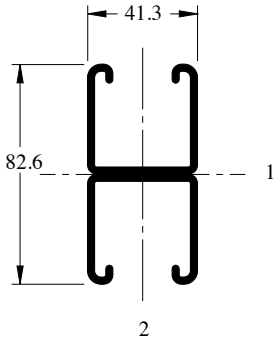
Pierced channels are found on pages 60 and 61.

Weight: 190 Lbs/C Ft (283 kg/100 m)

P1001

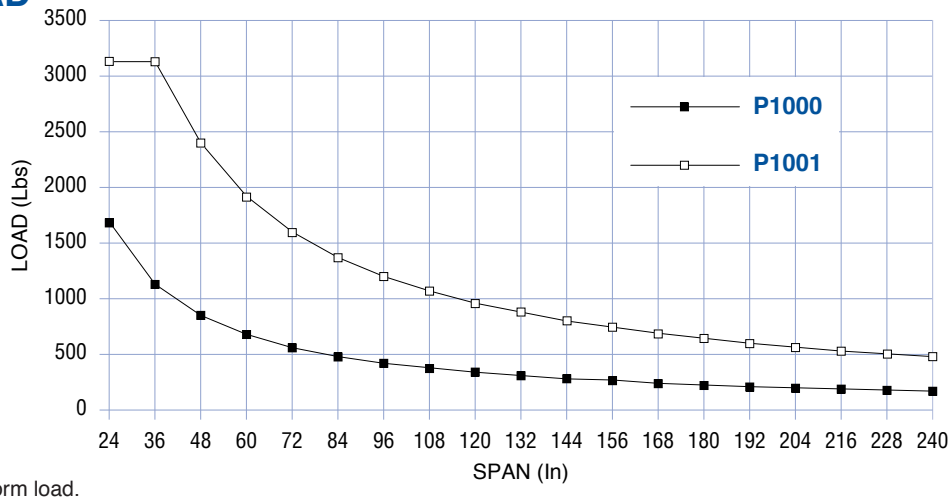






Weight: 380 Lbs/C Ft (566 kg/100 m)

BEAM LOAD*



*Maximum allowable uniform load.

Channel	Weight		Allowable Moment		Material Thickness		Standard Lengths		Finishes				Other Materials	
	Lbs/Ft	kg/m	In-Lb	N·m	In	mm	10'	20'	PL	GR	HG	PG	SS	EA
P1000	1.90	2.8	5,080	570	.105	2.7	■	■	■	■	■	■	■	■
P1001	3.80	5.7	14,390	1630	.105	2.7	■	■	■	■	■	■	■	■

Nominal thickness of 12 gage strip steel is .105 inches.

BEAM LOADING DATA

Span		Channel	Max. Allowable Uniform Load		Deflection at Uniform Load		Uniform Loading at Deflections					
							Span/180		Span/240		Span/360	
In	mm		Lbs	kN	In	mm	Lbs	kN	Lbs	kN	Lbs	kN
24	610	P1000 P1001	1690 3130*	7.5 13.9	0.06 0.02	1 1	1690 3130*	7.5 13.9	1690 3130*	7.5 13.9	1690 3130*	7.5 13.9
36	914	P1000 P1001	1130 3130*	5.0 13.9	0.13 0.07	3 2	1130 3130*	5.0 13.9	1130 3130*	5.0 13.9	900 3130*	4.0 13.9
48	1219	P1000 P1001	850 2400	3.8 10.7	0.22 0.13	6 3	850 2400	3.8 10.7	760 2400	3.4 10.7	510 2400	2.3 10.7
60	1524	P1000 P1001	680 1920	3.0 8.5	0.35 0.20	9 5	650 1920	2.9 8.5	490 1920	2.2 8.5	320 1630	1.4 7.3
72	1829	P1000 P1001	560 1600	2.5 7.1	0.50 0.28	13 7	450 1600	2.0 7.1	340 1600	1.5 7.1	220 1130	1.0 5.0
84	2134	P1000 P1001	480 1370	2.1 6.1	0.68 0.39	17 10	330 1370	1.5 6.1	250 1240	1.1 5.5	170 830	0.8 3.7
96	2438	P1000 P1001	420 1200	1.9 5.3	0.89 0.50	23 13	250 1200	1.1 5.3	190 950	0.8 4.2	130 640	0.6 2.8
108	2743	P1000 P1001	380 1070	1.7 4.8	1.14 0.64	29 16	200 1000	0.9 4.4	150 750	0.7 3.3	100 500	0.4 2.2
120	3048	P1000 P1001	340 960	1.5 4.3	1.40 0.79	36 20	160 810	0.7 3.6	120 610	0.5 2.7	80 410	0.4 1.8
144	3658	P1000 P1001	280 800	1.2 3.6	1.99 1.13	51 29	110 560	0.5 2.5	80 420	0.4 1.9	60 280	0.3 1.2
168	4267	P1000 P1001	240 690	1.1 3.1	2.72 1.55	69 39	80 410	0.4 1.8	60 310	0.3 1.4	40 210	0.2 0.9
192	4877	P1000 P1001	210 600	0.9 2.7	3.55 2.02	90 51	60 320	0.3 1.4	50 240	0.2 1.1	NR 160	NR 0.7
216	5486	P1000 P1001	190 530	0.8 2.4	4.57 2.53	116 64	50 250	0.2 1.1	40 190	0.2 0.8	NR 130	NR 0.6
240	6096	P1000 P1001	170 480	0.8 2.1	5.61 3.15	142 80	40 200	0.2 0.9	NR 150	NR 0.7	NR 100	NR 0.4

NR = Not Recommended

*Load limited by spot weld shear.

Notes:

1. Above loads include the weight of the member. This weight must be deducted to arrive at the net allowable load the beam will support.
2. Long span beams should be supported in such a manner as to prevent rotation and twist.
3. Allowable uniformly distributed loads are listed for various simple spans, that is, a beam on two supports. If load is concentrated at the center of the span, multiply load from the table by 0.5 and corresponding deflection by 0.8.
4. See page 66 for lateral bracing load reduction charts.

COLUMN LOADING DATA

Unbraced Height		Channel	Max. Allowable Load at Slot Face		Maximum Column Load Applied at C.G.							
					K = .65		K = .80		K = 1.0		K = 1.2	
In	mm		Lbs	kN	Lbs	kN	Lbs	kN	Lbs	kN	Lbs	kN
24	610	P1000 P1001	3400 6360	15.1 28.3	9600 23820	42.7 106.0	9500 23560	42.3 104.8	9320 23130	41.5 102.9	9100 22610	40.5 100.6
36	914	P1000 P1001	3000 6190	13.3 27.5	7640 23190	34.0 103.2	7400 22610	32.9 100.6	7000 21640	31.1 96.3	6490 20460	28.9 91.0
48	1219	P1000 P1001	2570 5970	11.4 26.6	5910 22310	26.3 99.2	5530 21270	24.6 94.6	4980 19560	22.2 87.0	4430 17460	19.7 77.7
60	1524	P1000 P1001	2230 5690	9.9 25.3	4780 21180	21.3 94.2	4390 19560	19.5 87.0	3850 16870	17.1 75.0	3330 13590	14.8 60.5
72	1829	P1000 P1001	1970 5360	8.8 23.8	4090 19790	18.2 88.0	3680 17460	16.4 77.7	3140 13590	14.0 60.5	2650 9570	11.8 42.6
84	2134	P1000 P1001	1760 4970	7.8 22.1	3600 18150	16.0 80.7	3170 14980	14.1 66.6	2630 10130	11.7 45.1	2160 7030	9.6 31.3
96	2438	P1000 P1001	1580 4510	7.0 20.1	3220 16270	14.3 72.4	2770 12120	12.3 53.9	2240 7750	10.0 34.5	1800 5380	8.0 23.9
108	2743	P1000 P1001	1430 4030	6.4 17.9	2910 14120	12.9 62.8	2450 9570	10.9 42.6	1930 6130	8.6 27.3	** 4250	** 18.9
120	3048	P1000 P1001	1290 3610	5.7 16.1	2640 11750	11.7 52.3	2180 7750	9.7 34.5	** 4960	** 22.1	** **	** **

**$\frac{KL}{r} > 200$

ELEMENTS OF SECTION

Channel	Areas of Section		Axis 1 - 1						Axis 2 - 2					
			I		S		r		I		S		r	
	In^2	cm^2	In^4	cm^4	In^3	cm^3	In	cm	In^4	cm^4	In^3	cm^3	In	cm
P1000	.556	3.6	.185	7.7	.202	3.3	.577	1.5	.236	9.8	.290	4.7	.651	1.7
P1001	1.112	7.2	.930	38.7	.572	9.4	.915	2.3	.472	19.6	.580	9.5	.651	1.7

I - Moment of Inertia S - Section Modulus r - Radius of Gyration

PHENIX MuTr STATION 2 SOUTH INSTALLATION PROCEDURE

procedure name

PHENIX Procedure No. PP-2.5.5.4-10

Revision: A **Date:** ~~4-28-00~~ 6-30-00 ABB

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approvals

7/10/00
PHENIX S E & I Date

Cognizant Scientist/Engineer Date
/Activity Manager

7/10/00
PHENIX /Safety Date

7/20/00
CA-D ES&H /SAFETY Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	6/30/2000	n/a	P. Kroon, W. Sondheim, W. Lenz, C. Pearson	n/a
RETIRED	Installation Completed	3/20/2007	n/a	D. Lynch, P. Giannotti, R. Pisani for PHENIX	D.Lynch

Station 2 South Installation Procedure PP-2.5.5.4-10

1.0 Purpose and Scope

1.1 The purpose of this procedure is to provide direction for the rigging of the station 2 south octants. This procedure provides detailed instructions for the safe installation of the octants to the "spider".
Note that the weight for each octant is 250 lbs.

2.0 Responsibilities

2.1 All operations shall be performed under the direction of the PHENIX experimental hall "person-in-charge", or their designee.

2.2 Due to the delicacy of this structure, and the critical alignment of its assembly in the magnet, this procedure and all relevant BNL safety guidelines must be strictly adhered to. In accordance with BNL policy, any individual may cease operations if they in any way feel unsafe or if they believe unsafe procedures are being followed, such a complaint shall be reviewed by the cognizant engineer, and if necessary, BNL ES&H Services.

2.3 A representative of the muon tracking mechanical team should be present for all lifts, to consult on procedures and answer any questions as they may arise.

3.0 Prerequisites

3.1 Training: All personnel involved in this procedure shall have reviewed this procedure, and be fully knowledgeable about the way in which the octant is mounted in the South magnet. A meeting will take place with all participants involved with this installation to review all aspects and answer any questions that any of the personnel may have.

3.2 All personnel involved in this procedure shall wear hardhats and safety shoes.

4.0 Precautions

4.1 The area where rigging operations will be performed shall be cordoned-off to all personnel except the "person in charge" and the technicians assigned to perform this procedure.

4.2 Some operations will require personnel to work in close proximity to suspended loads. Do not permit anyone to be positioned under the load.

4.3 Lift the octants with the commercial lifting fixture only and only with the protective covers in place on the octant.

5.0 Equipment List

5.1 Appropriate ANVER lifting fixture, model number LBT50-MROT-SP, serial number 001764, rated load capacity 500 pounds. All four steel 5/16-18 X 2" length bolts used to attach the ANVER lifter to the four tapped holes on the octant downstream frame, as located on dwg. Number 002-0212-325 sheet D1 (see G holes) should be tightened to 150 in-lbs. PHENIX dwg no. 002-0212-610

5.2 "C" fixture, rated load capacity 800 pounds.

5.3 Guide ropes.

5.4 Shackles, rated minimum load capacity 1000 pounds.
5.5 Stainless Steel hardware, including threaded rods.

6.0 Preparation

6.1 Support "spider" in place and surveyed.
6.2 Install the stainless steel threaded rods in place on the "spider" where indicated on PHENIX drawing no. 002-0212-260, sheets D1, D2 and D3, four locations on each spoke, 32 total.
6.3 Each octant mounts to the spider in 10 locations; the 4 C holes along each side of an octant and the two middle C holes along the outer edge. These are indicated on PHENIX drawing no. 002-0212-328 sheet D1 and 002-0212-326 sheet D1. See the mounting locations on spider drawings 002-0212-260 sheets d1-d3.
6.4 Install bottom platform and side stairs as shown on magnet scaffolding assembly drawing package, Ray Savino will supply prints and hardware.
6.5 In order for the rigging crew in 1008 to become familiar with both the ANVER lifter and the "C" fixture, a non critical full scale station 2 front octant is available to practice with in the magnet.
6.6 THERE IS ONLY 1 5/8-INCH CLEARANCE BETWEEN THE CATHODE CARD CONNECTORS AND THE MAGNET LAMPSHADE PANEL. This is why using the non-critical octant in 6.5 is important.
6.7 It is critical that the brake on the crane used is in working order, lifts of a fraction of an inch may be required – and the use of a chain fall, or similar device may be required to get the fine adjustment needed to locate these chambers in the magnet.
6.8 As an added precaution, to prevent damage to the cathode readout circuit cards, install two 5/16-18 bolts that are at least two inches longer then the height of the circuit cards from the top edge of the detector frame. Screw these bolts into two of the threaded holes on the top edge of the frame. These should be removed after the octant has been secured to the support spider.

7.0 Procedure

7.1 Front octants.(smaller octants)
- 7.1.1 The frame side with the machined surface cutout faces are downstream, see front octant rear frame drawing 002-0212-325 sheet D1. Installation proceeds from the bottom of the spider to the top at every other location beginning wit the 6:00 o'clock octant followed by the 3:00,9:00,12:00.
- 7.1.2 FIRST OCTANT ONLY _ 6:00 position
  - 7.1.2.1 Attach "C" fixture to the crane hook and attach the ANVER lifting fixture to the "C" fixture.
- 7.1.3 Attach the ANVER lifting fixture to the octant in the horizontal position following the manufacturer instructions and with the fixtures provided. Lift the octant and tilt the octant to a vertical position.
- 7.1.4 Rotate the octant to the desired orientation on the "spider".

7.1.5 Attach guide ropes to the octant as needed.

7.1.6 First Octant Only

7.1.6.1 Lift and lower the octant in place downstream of the spider, to allow possible rotation of the octant to get into position under the piston. Once the octant is directly under the piston move it upstream and attach to the "spider" at the outside boundary, us the threaded rods as guides on ecah side of the octant. Place temporary nuts and spacers on the side threaded rod. Use guide ropes to stabilize the octant. Torque the 3/8-16 stainless steel bolts and nuts to 236 in-lbs.

7.1.7 Remaining front octants

7.1.7.1 No "C" fixture needed. Install the 3:00 and 9:00 o'clock octants next followed by the 12:00 o'clock. Lift and lower the octant into place. Attach to the spider and place temporary nuts and spacers on the threaded rod on the sides of the octants.

7.1.8 Remove gas window aluminum plates on the upstream side of the octants.

7.1.9 Install alignment lenses, 4 per octant as shown on dwgs numbered 002-0212-332 sheets D1 and D2, 002-0212-234 sheet D1, 002-0212-235 sheet D2 and 002-0212-236 sheet D6. The lens blocks that mount along the outer edge will be installed later.

7.2 Rear Octants.

7.2.1 The frame side with the machined surface for the lens blocks faces downstream see dwg. Number 002-0212-327 sheet D1. Installation proceeds from the bottom of the spider to the top at every other location beginning at 4:30 o'clock and proceeding in order 4:30,7:30,1:30,10:30.

7.2.2 Attach the ANVER lifting fixture to the octant in the horizontal position following the manufacturer instructions. Lift the octant and tilt the octant to a vertical position.

7.2.3 Rotate the octant to the orientation in the "spider".

7.2.4 Attach guide ropes to the octant as needed.

7.2.5 Remove temporary nuts from sides of adjacent octants.

7.2.6 Attach 2 stabilizer brackets to the outside cross member on the spider, drawing number 002-0212-260 sheets D1 and 002-0212-261 sheet D1.

7.2.7 Remove protective aluminum cover on upstream side of octant.

7.2.8 Remove temporary nuts from threaded rods and aluminum spacer block, along spoke where octant will be attached.

7.2.9 Lift and lower the octant into place and attach to the stabilizer brackets at the outside boundary. Place nuts and washers on the side threaded rods and torque to 236 in-lbs.

7.2.10 Install alignment lenses, 4 per octant as shown on dwgs numbered 002-0212-332 sheets D1 and D2, 002-0212-234 sheets D1, 002-

0212-235 sheet D2 and 002-0212-236 sheet D6. The three lens blocks that mount along the outer edge will be attached later.

7.3 Remove downstream protective gas window covers from octants only after the following work has been completed; the FEE mechanical structure is in place, the lower scaffolding platform and side steps are in place, the bottom station 2 cross rib assembly is installed and connected to the chamber. It will be difficult to remove these covers later – so removal from the bottom up as the FEE cross ribs are installed is the current thinking.

8.0 Alignment

8.1 Alignment crew – surveys the octants from both the upstream and downstream sides, all bolts are checked for a torque of 236 in-lbs.

REVISIONS			
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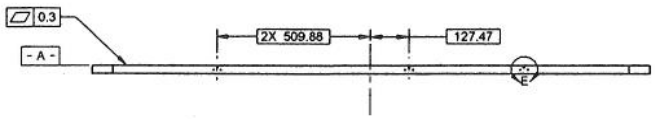
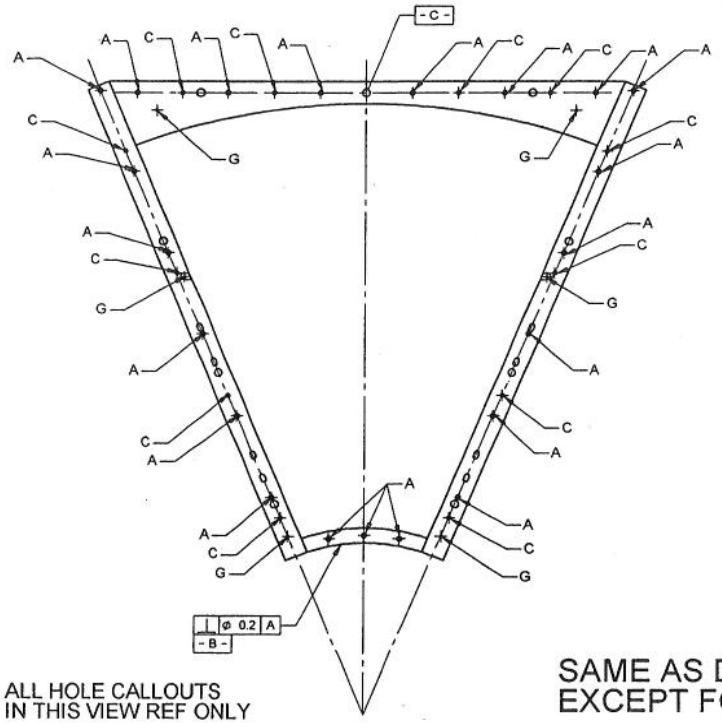
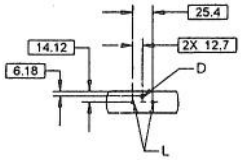
A	RELEASED PER ECN# 002-0212-328-A	7/16/98	T. THOMPSON

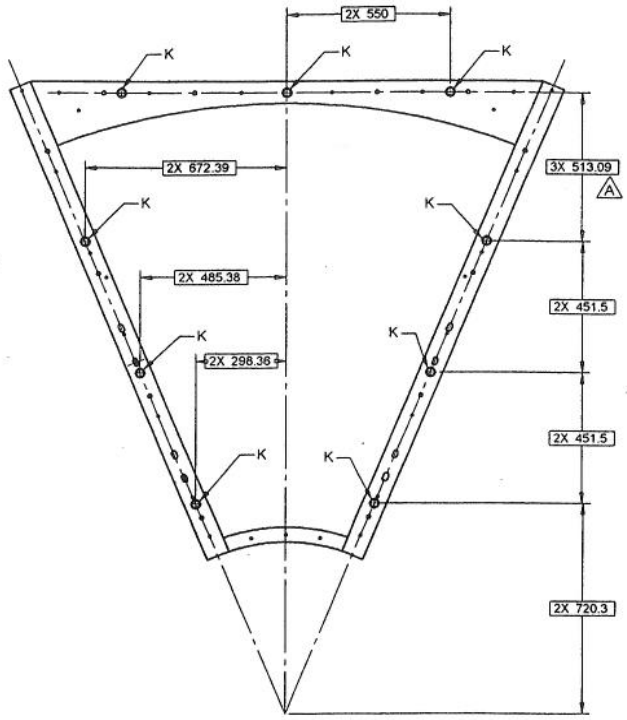


FAR SIDE VIEW





DETAIL E
SCALE 1 : 3
3 PATTERNS



6-30-98 W.S.

ALL HOLE CALLOUTS
IN THIS VIEW REF ONLY

SAME AS DRAWING# 002-0212-324
EXCEPT FOR AS SHOWN

SEP 0 6 1998

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1982
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .38
5. ALL INSIDE CORNERS TO BE .38 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .76-1.52 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO. PLUS DASH NO. PLUS SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

HOLE	NO. REQ'D	TAPPED/MACHINED HOLE	↧	⌴ Ø	↧	POSITIONAL TOLERANCING
D	3	.190(#10) - 32 UNF-2B	12.70	–	–	⌖ Ø 0.3Ⓜ A BⓂ CⓂ
K	9	Ø 25.425 / 25.400 (USE Ø 1.001 IN. REAM)	THRU	31.75 FROM FAR SIDE	7.14	⌖ Ø 0.03Ⓜ A BⓂ CⓂ
L	6	PRESS FIT FOR Ø .125 IN STANDARD DOWEL PIN	15.09	–	–	⌖ Ø 0.3Ⓜ A BⓂ CⓂ

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS X. ± .25, .X ± .25, .XX ± .25; ANGULAR ± .25°; SURFACE FINISH = 3.2

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212-328-1

	SIGNATURE	DATE
DESIGNED	E. ROMERO	5-29-98
DRAWN	E. ROMERO	5-29-98
CHECKED	H. SALAZAR	5-29-98
ENGR	T. THOMPSON	5-29-98
APPROVED	T. THOMPSON	5-29-98

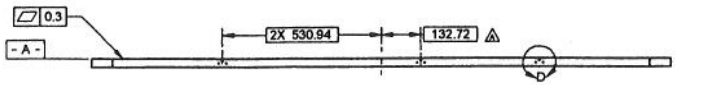
SCALE 1/8

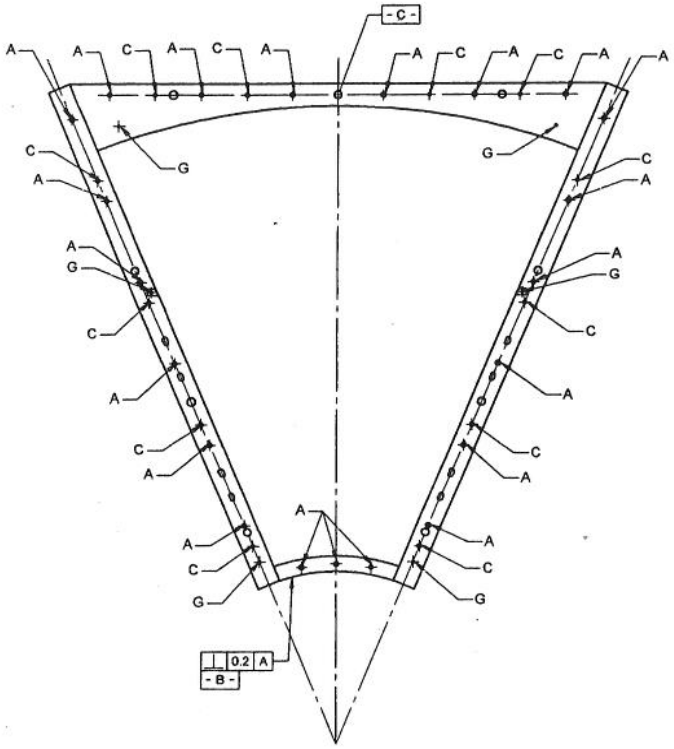
HYTEC, INC

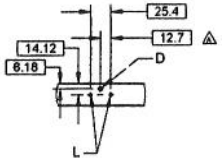
TITLE: PHENIX STATION 2 SOUTH FRONT CHAMBER FRONT FRAME

DWG. NO 002-0212-328 SIZE D SHEET NO 1 of 1

REVISION A

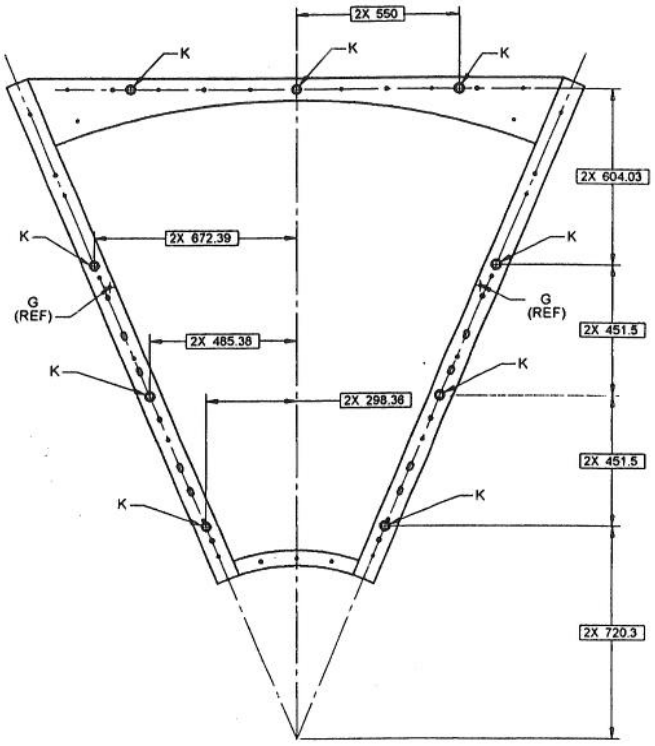






DETAIL D
SCALE 1 : 3
3 PATTERNS

FAR SIDE VIEW



ALL HOLE CALLOUTS
IN THIS VIEW REF ONLY

SAME AS DRAWING# 002-0212-322
EXCEPT FOR AS SHOWN

8/2/99 W.S.

AUG 0 3 1999

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1982
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .38
5. ALL INSIDE CORNERS TO BE .38 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .76-1.52 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO. PLUS DASH NO. PLUS SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

HOLE	NO. REQ'D	TAPPED/MACHINED HOLE	↧	⌴ ⌀	↧	POSITIONAL TOLERANCING
D	3	.190 (#10) - 32 UNC-2B	12.7	–	–	⌖ ⌀ 0.3Ⓜ A BⓂ CⓂ
K	9	Ø 25.425 / 25.4 (USE 1.001 IN. REAM)	THRU	31.75 FROM FAR SIDE	7.14	⌖ ⌀ 0.03Ⓜ A BⓂ CⓂ
L	6	PRESS FIT FOR Ø.125 IN. STD. DOWEL PIN	THRU	⚠ –	–	⌖ ⌀ 0.3Ⓜ A BⓂ CⓂ

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS .X ± .25 .XX ± .25 ANGULAR ± .25° SURFACE FINISH 3.2

FINISH

PART NO. 002-0212-326-1

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

DRAWN	E. ROMERO	5-29-98
CHECKED	S. RUMBAU	5-29-98
ENG APPR.	H. SALAZAR	5-29-98
MFG APPR.	T. THOMPSON	5-29-98
Q.A.	T. THOMPSON	5-29-98

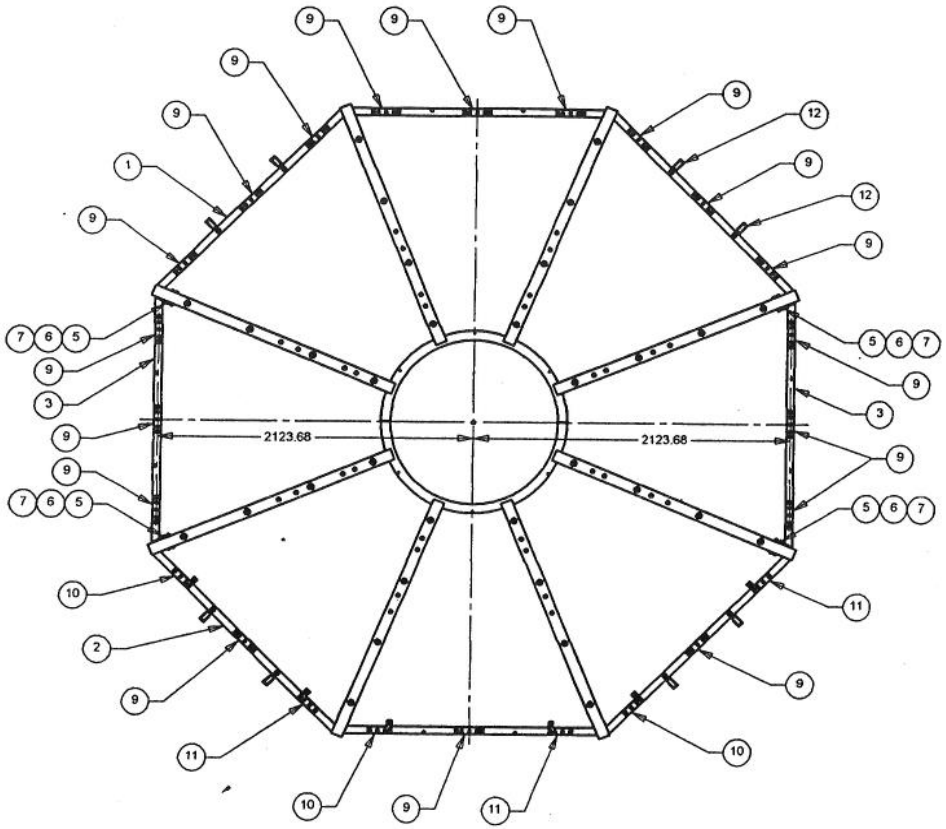
HYTEC, INC

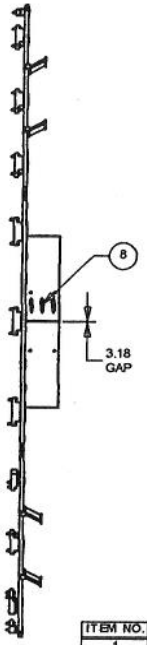
PHENIX STATION 2 SOUTH
REAR CHAMBER
FRONT FRAME

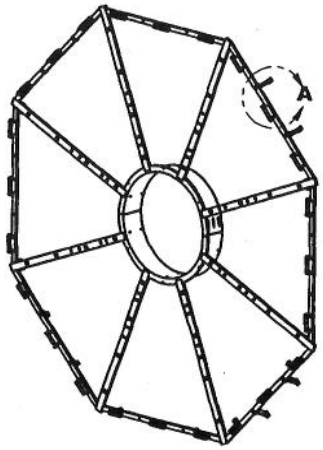
002-0212-326 D 1 of 1

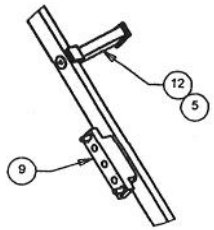
1/8" A

REV	DESCRIPTION	REVISED	DATE	APPROVED









DETAIL A
SCALE 1 : 6

ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL
1	1	002-0212-260-D2	Top Frame Sub-Assembly	
2	1	002-0212-260-D3	Bottom Frame Sub-Assembly	
3	2	002-0212-260-D6	Splice Tube Weldment	
4	8		Soc Hd Screw, 3/8-16 UNC-2A X 1.25 lg.	SST
5	14		Soc Hd Screw, 3/8-16 UNC-2A X 3.75 lg.	SST
6	16		Flat Washer, 3/8	SST
7	8		Hex Nut, 3/16 UNC-2B	SST
8	8	002-0212-261-D1	Inner Detector Stabilizer	
9	18	002-0212-262-D1	Support Bracket Assembly	
10	3	002-0212-264-D1	Right Support Bracket Assembly	
11	3	002-0212-263-D1	Left Support Bracket Assembly	

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

OCT 13 1999

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS .X ± xx .25, .X ± xx .20, .XX ± xx .25 ANGULAR ± xx .25° SURFACE FINISH = 3.2

FINISH

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	8-26-99
DRAWN	Roger L. Smith	8-26-99
CHECKED	Walt Sondheim	10-09-99
ENGR	Walt Sondheim	10-09-99
APPROVED	Walt Sondheim	10-09-99

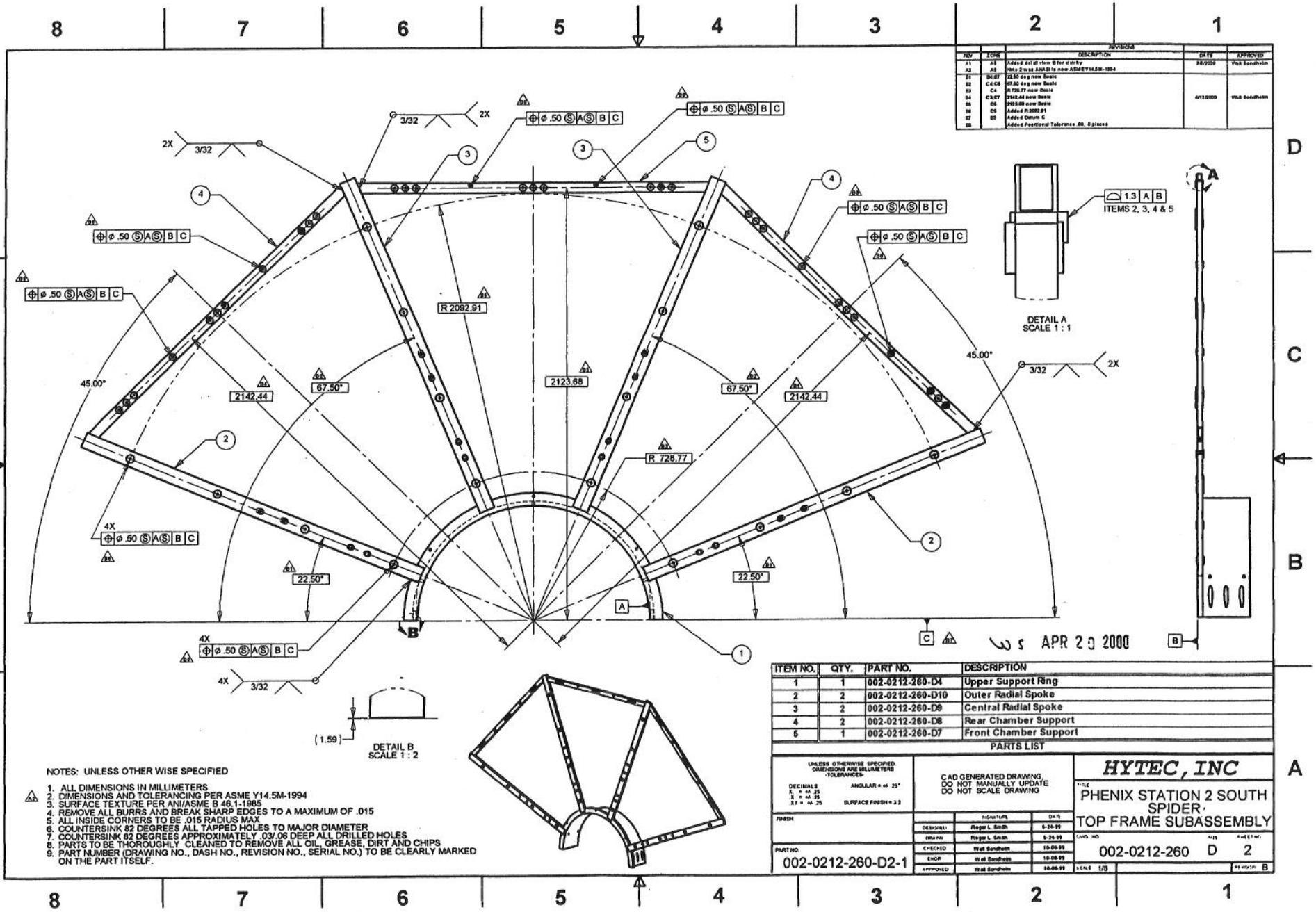
PART NO. 002-0212260-D1-1

HYTEC, INC

TITLE: PHENIX STATION 2 SOUTH SPIDER SUPPORT RING ASSEMBLY

DWG NO. 002-0212-260 SIZE D SHEET NO 1

SCALE 1/16 REVISION



REV	ZONE	DESCRIPTION	DATE	APPROVED
A1	A8	Added detail view B for clarity	3/6/2000	Walt Sandheim
A2	A8	Note 2 was ANSI B is now ASME Y14.5M-1994		
B1	B4,B7	22.50 deg now Basic		
B2	C4,C6	67.50 deg now Basic		
B3	C4	R728.77 now Basic		
B4	C3,C7	2142.44 now Basic	4/12/2000	Walt Sandheim
B5	C5	2123.68 now Basic		
B6	C9	Added R2092.91		
B7	B5	Added Datum C		
B8		Added Positional Tolerance .50, 8 places		

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	002-0212-260-D4	Upper Support Ring
2	2	002-0212-260-D10	Outer Radial Spoke
3	2	002-0212-260-D9	Central Radial Spoke
4	2	002-0212-260-D8	Rear Chamber Support
5	1	002-0212-260-D7	Front Chamber Support

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ASME Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETERS TOLERANCES: DECIMALS X = +/- .25, .X = +/- .25, .XX = +/- .25; ANGULAR = +/- 25°; SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212-260-D2-1

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	6-26-99
DRAWN	Roger L. Smith	6-26-99
CHECKED	Walt Sandheim	10-08-99
ENGR	Walt Sandheim	10-08-99
APPROVED	Walt Sandheim	10-08-99

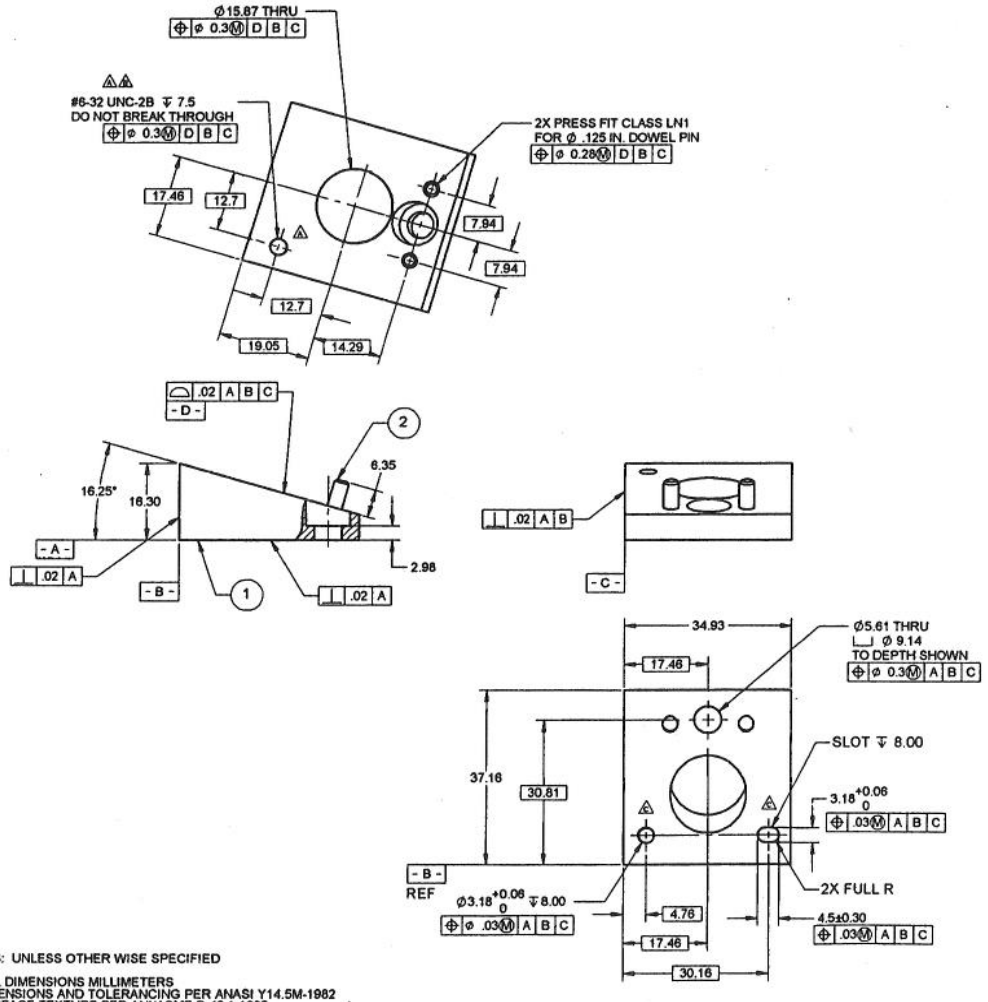
HYTEC, INC

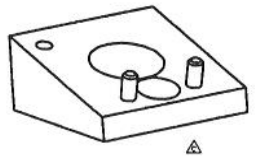
TITLE: PHENIX STATION 2 SOUTH SPIDER TOP FRAME SUBASSEMBLY

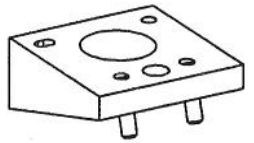
DWG NO. 002-0212-260 | SIZE D | SHEET NO. 2 | REV B

SCALE 1/8

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE ECN #002-0212-332-A	10/15/99	T. THOMPSON
B	SEE ECN #002-0212-332-B	12/15/99	T. THOMPSON
C	SEE ECN #002-0212-332-C	7/28/99	T. THOMPSON







8/2/99 W. S.

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1982
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .38
5. ALL INSIDE CORNERS TO BE .38 RADIUS MAX
6. COUNTERSINK 82-90 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82-90 DEGREES APPROXIMATELY .76-1.52 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO. PLUS DASH NO. PLUS SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

W. S. AUG 0 3 1999

ITEM	QUANTITY	DESCRIPTION	MATERIAL
1	1	STOCK	ALUMINUM 6061-T6
2	⚠ 2	.125 IN. STD. DOWEL, LENGTH= 1/2 IN. McMASTER-CARR# 98381A471	ALLOY STEEL

PARTS LIST

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE METRIC -TOLERANCES- DECIMALS .X ± ±0.2M .XX ± ±0.25 ANGULAR = ±0.25° SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

	SIGNATURE	DATE
DESIGNED	E. ROMERO	7-7-99
DRAWN	E. ROMERO	7-7-99
CHECKED	H. SALAZAR	7-7-99
ENGR	T. THOMPSON	7-7-99
APPROVED	T. THOMPSON	7-7-99

PART NO. 002-0212-332-D1-1

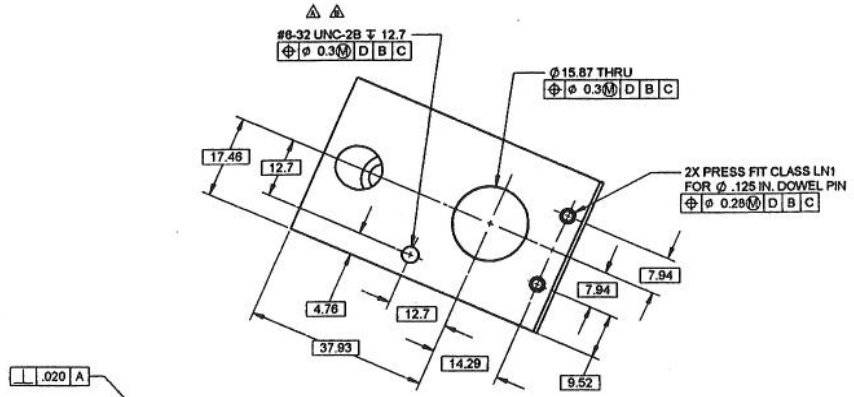
HYTEC, INC

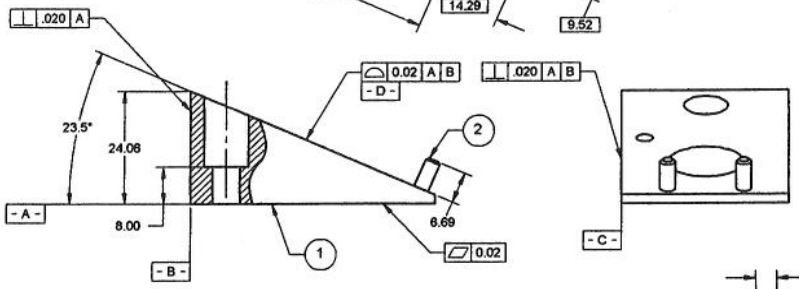
TITLE: STATION 2 SOUTH LENS HOLDER MOUNTING BLOCK F-C-L-B F-C-R-B

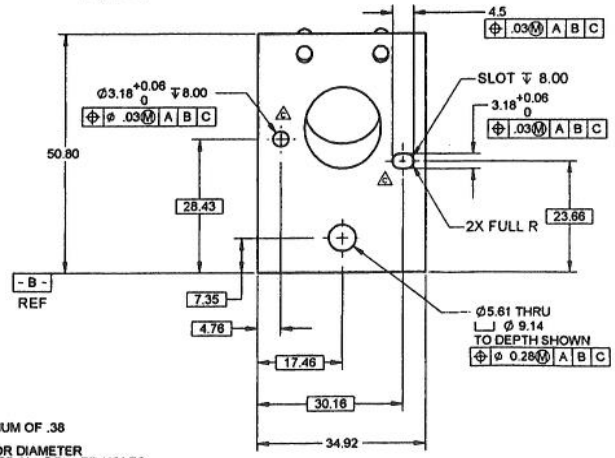
DWG NO. 002-0212-332 REV D SHEET 1 of 2

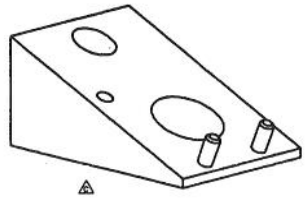
SCALE 2/1 WEIGHT C

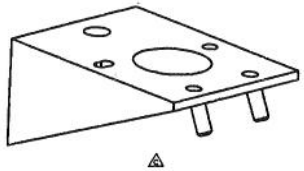
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE ECN #002-0212-332-03-A	10-15-98	T. THOMPSON
B	SEE ECN #002-0212-332-03-B	12-15-98	T. THOMPSON
C	SEE ECN #002-0212-332-03-C	7-7-99	T. THOMPSON











8/2/99 W. S.

AUG 0 3 1999

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1982
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .38
5. ALL INSIDE CORNERS TO BE .38 RADIUS MAX
6. COUNTERSINK 82-90 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82-90 DEGREES APPROXIMATELY .76-1.52 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO. PLUS DASH NO. PLUS SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

ITEM	QUANTITY	DESCRIPTION	MATERIAL
1	1	STOCK	ALUMINUM 6061-T6
2	2	.125 IN. STD. DOWEL, LENGTH= 3/8 IN McMASTER-CARR# 98381A470	ALLOY STEEL

PARTS LIST

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE METRIC -TOLERANCES- DECIMALS .X = ±0.254 .XX = ±0.25 ANGULAR = ±0.25° SURFACE FINISH = 3.2

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

	SIGNATURE	DATE
DESIGNED	E. ROMERO	7-7-99
DRAWN	E. ROMERO	7-7-99
CHECKED	H. SALAZAR	7-7-99
ENGR	T. THOMPSON	7-7-99
APPROVED	T. THOMPSON	7-7-99

PART NO. 002-0212-332-D2-1

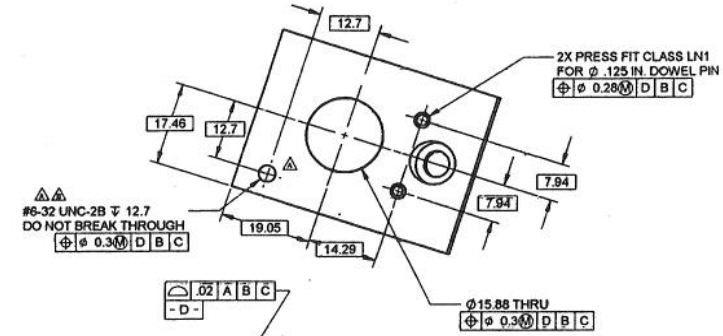
HYTEC, INC

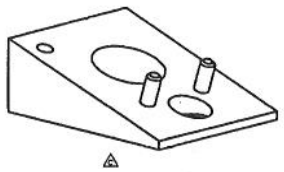
TITLE: STATION 2 SOUTH LENS HOLDER MOUNTING BLOCK F-C-L-M F-C-R-M

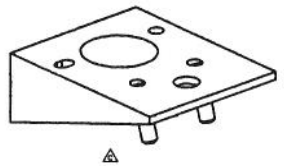
DWG NO. 002-0212-332 REV D SHEET 2 of 2

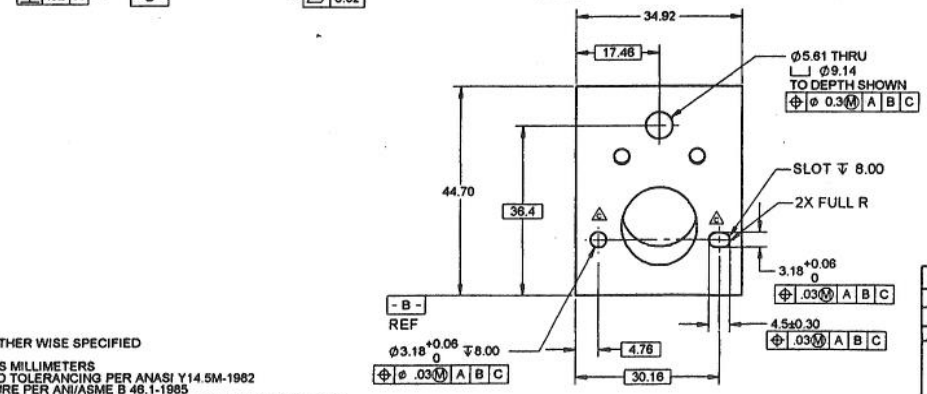
SCALE: 2/1 SIZE C

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE ECN #002-0212-333-D1-A	10/13/98	T. THOMPSON
B	SEE ECN #002-0212-333-D1-B	12/15/98	T. THOMPSON
C	SEE ECN #002-0212-333-D1-C	7/7/99	T. THOMPSON









NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1982
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .38
5. ALL INSIDE CORNERS TO BE .38 RADIUS MAX
6. COUNTERSINK 82-90 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82-90 DEGREES APPROXIMATELY .76-1.52 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO. PLUS DASH NO. PLUS SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

8/2/99 W. S.

W. S. AUG 0 3 1999

ITEM	QUANTITY	DESCRIPTION	MATERIAL
1	1	STOCK	ALUMINUM 6061-T6
2	⚠ 2	.125 IN. STD. DOWEL, LENGTH= 1/2 IN. McMASTER-CARR# 98381A471	ALLOY STEEL

PARTS LIST

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE METRIC -TOLERANCES- DECIMALS X = ±0.25, XX = ±0.25, ANGULAR = ±0.25° SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

	SIGNATURE	DATE
DESIGNED	E. ROMERO	7-7-99
DRAWN	E. ROMERO	7-7-99
CHECKED	H. SALAZAR	7-7-99
ENGR	T. THOMPSON	7-7-99
APPROVED	T. THOMPSON	7-7-99

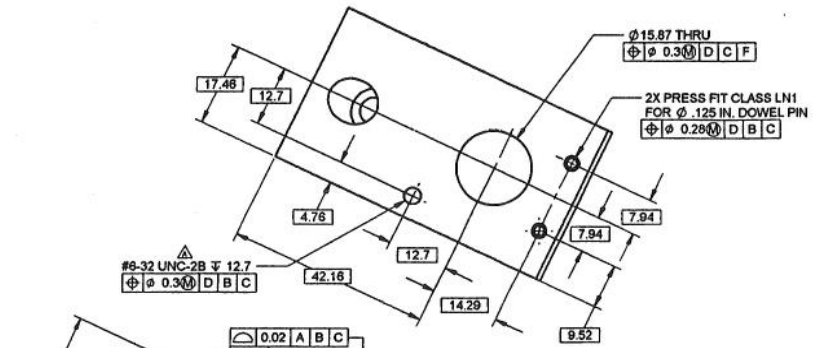
PART NO. 002-0212-333-D1-1

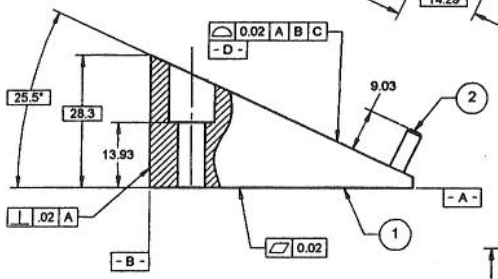
HYTEC, INC

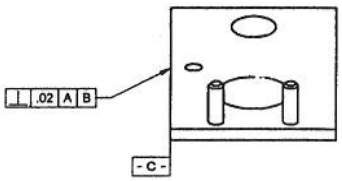
STATION 2 SOUTH
LENS HOLDER MOUNTING BLOCK
R-C-L-B
R-C-R-B

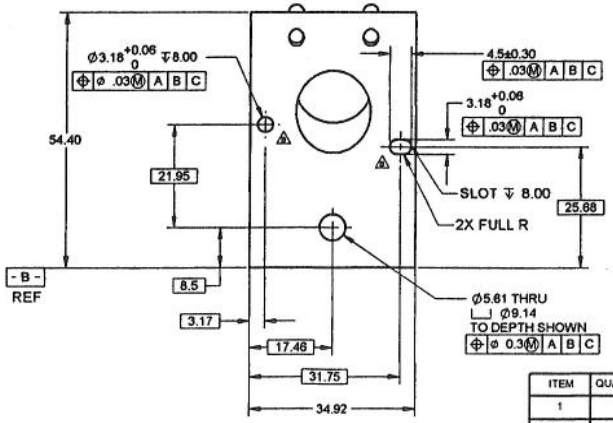
002-0212-333 D 1 of 2

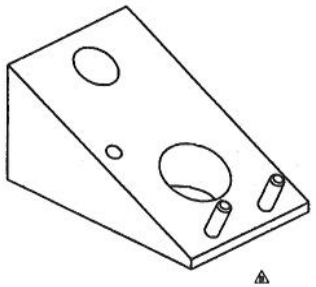
SCALE 2/1 C

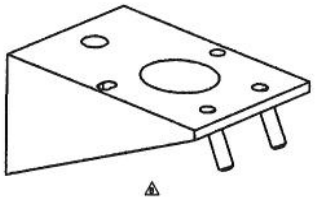












REV	DESCRIPTION	DATE	APPROVED
A	SEE ECN #982-0212-333-D2-A	10/15/98	T. THOMPSON
B	SEE ECN #982-0212-333-D2-B	7/8/99	T. THOMPSON

8/2/99 W. S.

AUG 0 3 1999

ITEM	QUANTITY	DESCRIPTION	MATERIAL
1	1	STOCK	ALUMINUM 6061-T6
2	2 ⚠	.125 IN. STD. DOWEL, LENGTH= 1/2 IN. McMASTER-CARR# 98381A471	ALLOY STEEL

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1982
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .38
5. ALL INSIDE CORNERS TO BE .38 RADIUS MAX.
6. COUNTERSINK 82-90 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82-90 DEGREES APPROXIMATELY .76-1.52 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO. PLUS DASH NO. PLUS SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE METRIC -TOLERANCES- DECIMALS .X ± ±0.25 .XX ± ±0.25 ANGULAR ± ±0.25° SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212-333-D2-1

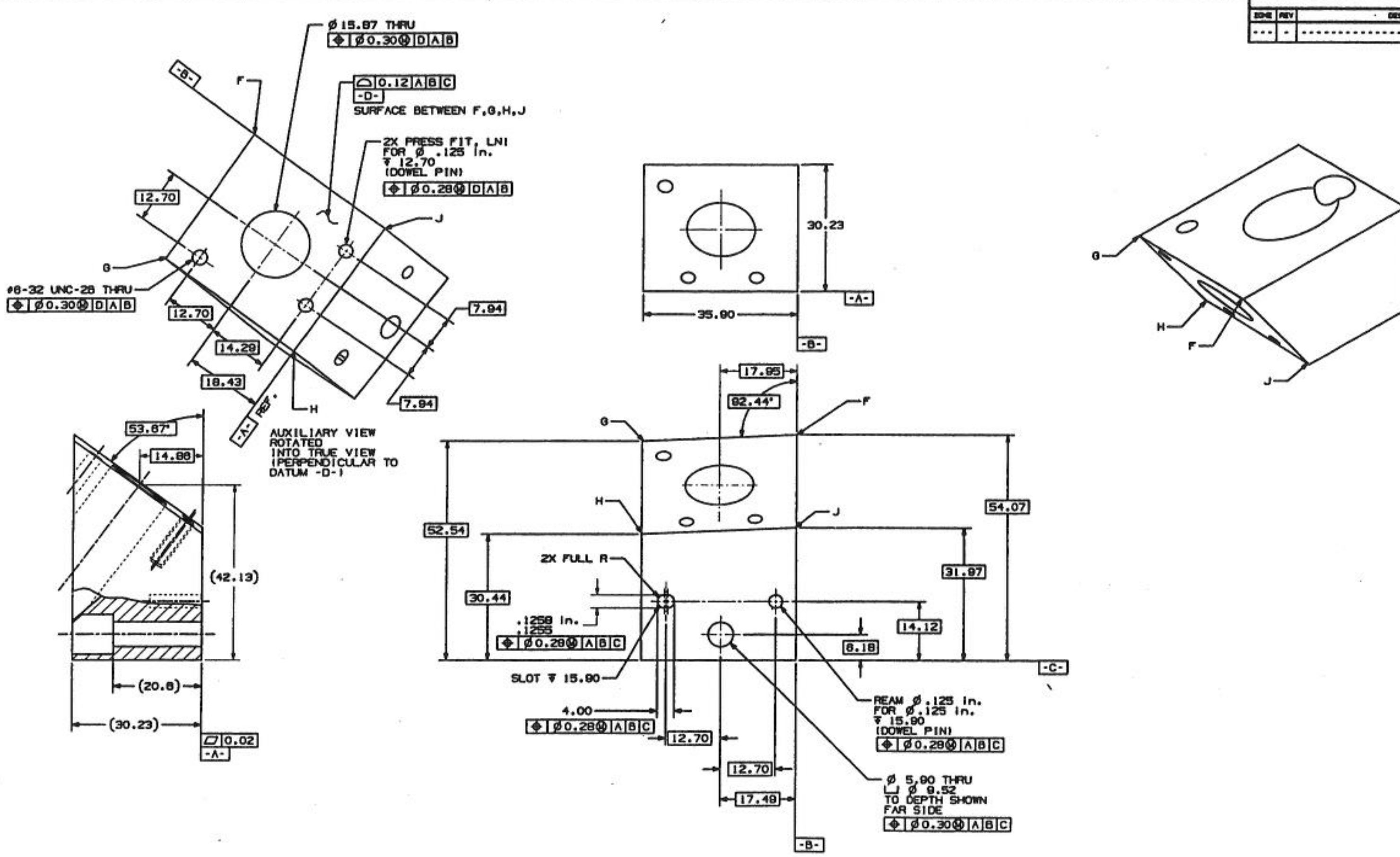
	SIGNATURE	DATE
DESIGNED	E. ROMERO	7-7-99
DRAWN	E. ROMERO	7-7-99
CHECKED	H. SALAZAR	7-7-99
ENGR	T. THOMPSON	7-7-99
APPROVED	T. THOMPSON	7-7-99

HYTEC, INC

STATION 2 SOUTH
LENS HOLDER MOUNTING BLOCK
R-C-L-M
R-C-R-M

DWG NO. 002-0212-333 SIZE D SHEET 2 of 2

SCALE 2/1 REV B



NOTES:

1. DIMENSIONS & TOLERANCING PER ANSI Y14.5M-1982.
2. SURFACE TEXTURE PER ANSI/ASME B 46.1-1985.
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF 0.38
4. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS.
5. ALL INSIDE CORNERS TO BE 0.38 RADIUS MAX.

W.S. MAY 0 5 1999

W.S. JAN 0 8 2000

METRIC

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	ZONE	ITEM NO
16	--------	----------------	ALUMINUM, 6061-T6		--

PARTS LIST/BILL OF MATERIAL

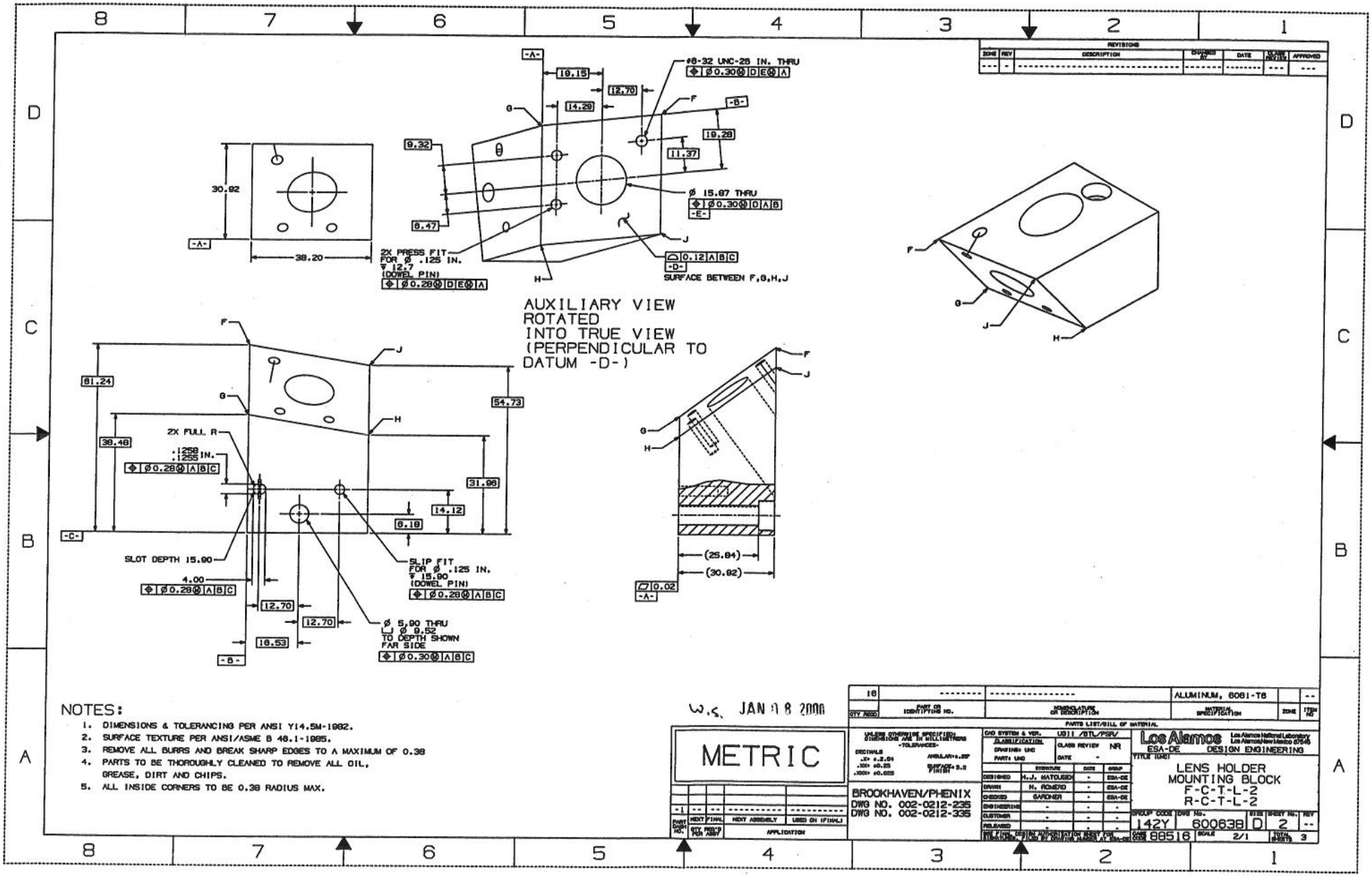
BROOKHAVEN/PHENIX
DWG NO. 002-0212-234
DWG NO. 002-0212-334

Los Alamos — ESA-DE DESIGN ENGINEERING

TITLE: LENS HOLDER MOUNTING BLOCK F-C-T-C-2 R-C-T-C-2

Role	Signature	Date	Group
DESIGNED	H.J. MATOUSEK	-	ESA-DE
DRAWN	N. ROMERO	-	ESA-DE
CHECKED	GARDNER	-	ESA-DE

GROUP CODE 142Y | DWG No. 600638 | SIZE D | SHEET NO. 1 | REV -- | CAGE CODE 88516 | SCALE 2/1 | TOTAL SHEETS 3



NOTES:

1. DIMENSIONS & TOLERANCING PER ANSI Y14.5M-1982.
2. SURFACE TEXTURE PER ANSI/ASME B 46.1-1985.
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF 0.38
4. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS.
5. ALL INSIDE CORNERS TO BE 0.38 RADIUS MAX.

W.S. JAN 18 2000

METRIC

BROOKHAVEN/PHENIX
DWG NO. 002-0212-235
DWG NO. 002-0212-335

QTY	PART OR IDENTIFYING NO.	DESCRIPTION OR DESCRIPTION	MATERIAL SPECIFICATION
16	---	---	ALUMINUM, 6061-T6

PARTS LIST/BILL OF MATERIAL

REVISIONS					
ZONE	REV	DESCRIPTION	DRAWN BY	DATE	CLASS REVIEW	APPROVED
---	-	---	---	---	---	---

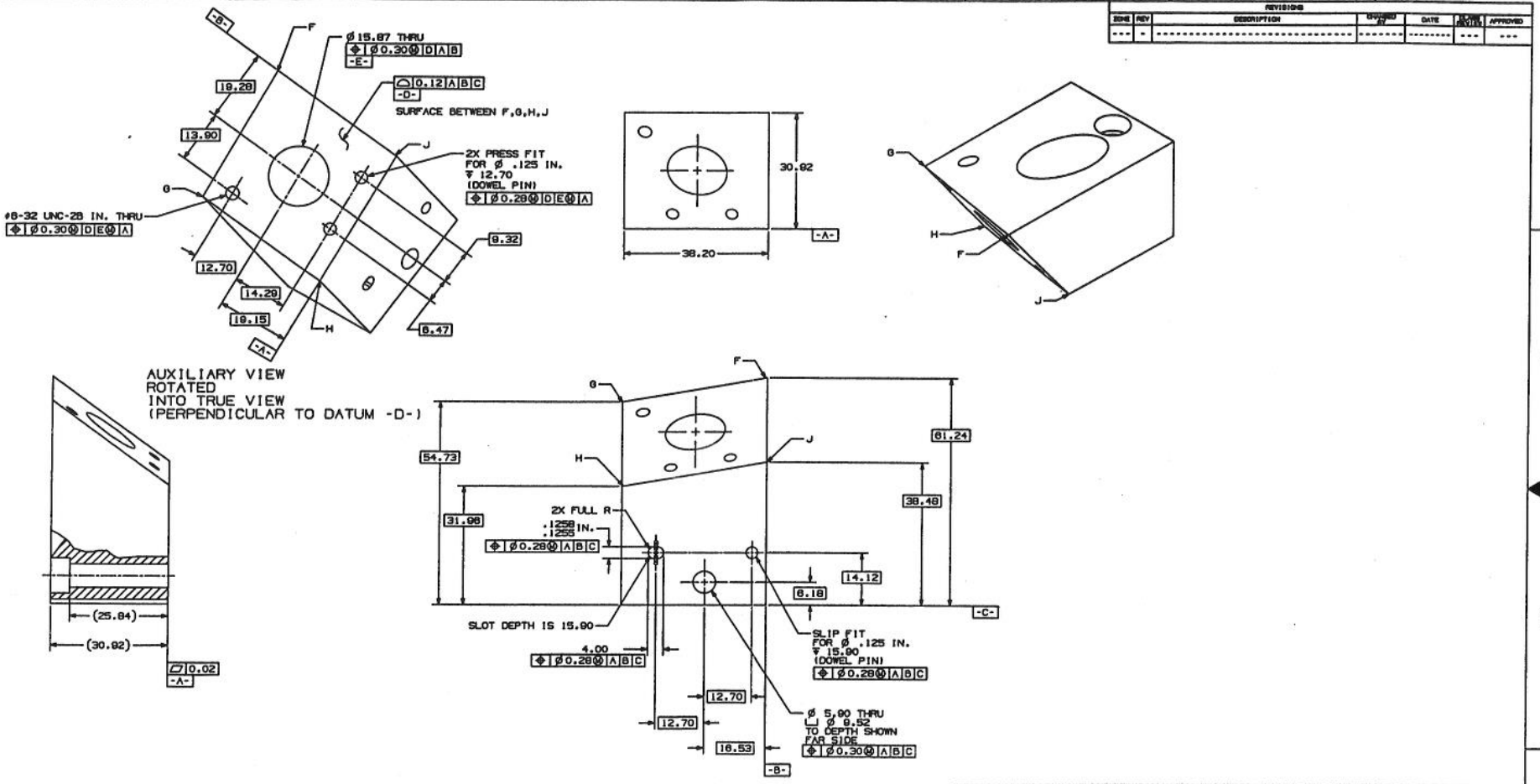
Los Alamos National Laboratory, Los Alamos, New Mexico 87545
ESA-DE DESIGN ENGINEERING

TITLE (UNC)
LENS HOLDER
MOUNTING BLOCK
F-C-T-L-2
R-C-T-L-2

DESIGNED	H.J. MATOUSEK		ESA-DE
DRAWN	N. ROMERO		ESA-DE
CHECKED	GARDNER		ESA-DE
ENGINEERING			
CUSTOMER			
RELEASED			

CAD SYSTEM & VER. UG11 /STL/PSRV
CLASSIFICATION
CLASS REVIEW NR
DRAWING UNC
PART: UNC
DATE

GROUP CODE 142Y | DWG No. 600638 | SIZE D | SHEET No. 2 | REV --
CAGE CODE 88516 | SCALE 2/1 | TOTAL SHEETS 3



NOTES:

1. DIMENSIONS & TOLERANCING PER ANSI Y14.5M-1982.
2. SURFACE TEXTURE PER ANSI/ASME B 46.1-1985.
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF 0.38
4. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS.
5. ALL INSIDE CORNERS TO BE 0.38 RADIUS MAX.

W.S. JAN 0 8 2006

METRIC

BROOKHAVEN/PHENIX
DWG NO. 002-0212-238
DWG NO. 002-0212-338

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	ZONE	ITEM NO
16	--------	----------	ALUMINUM, 6061-T6		--

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545
ESA-DE DESIGN ENGINEERING

TITLE (UNDI)
LENS HOLDER
MOUNTING BLOCK
F-C-T-R-2,
R-C-T-R-2

GROUP CODE	DWG No.	SIZE	SHEET No.	REV
142Y	600638	D	3	--

DATE 88516 | SCALE 2/1 | TOTAL SHEETS 3

PHENIX

PHENIX MuTr STATION 3 SOUTH INSTALLATION PROCEDURE

procedure name

PHENIX Procedure No. PP-2.5.5.4-11

Revision: A **Date: 4-28-00**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials
1	7/17/00	2 & 3	BJK.

Approvals

5/17/00
PHENIX S E & I Date

8MAY00
Cognizant Scientist/Engineer Date /Activity Manager

5/8/00
PHENIX Safety Date

6/29/00
CA-D ES&H /SAFETY Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	4/28/2000	n/a	P. Kroon, (1 unintelligible), W. Lenz, C. Pearson	n/a
RETIRED	Installation Completed	3/20/2007	n/a	D. Lynch, P. Giannotti, R. Pisani for PHENIX	D. Lynch

Station 3 South Installation Procedure, PP-2.5.5.4-11

1.0 Purpose and Scope

1.1 The purpose of this procedure is to provide direction for the rigging of the station 3 south octants. This procedure will provide detailed instructions for the safe installation of the octants onto their mounting location on the back plate of the magnet
Note that the weight for each octant is 300 lbs.

2.0 Responsibilities

2.1 All operations shall be performed under the direction of the PHENIX experimental hall "person-in-charge", or their designee.

2.2 Due to the delicacy of this structure, and the critical alignment of its assembly in the magnet, this procedure and all relevant BNL safety guidelines must be strictly adhered to. In accordance with BNL policy, any individual may cease operations if they in any way feel unsafe or if they believe unsafe procedures are being followed, such a complaint shall be reviewed by the cognizant engineer, and if necessary, BNL ES&H Services.

2.3 A member of the muon tracking mechanical team should be present for all critical lifts, to consult on procedures and answer any questions as they may arise.

3.0 Prerequisites

3.1 Training: All personnel involved in this procedure shall have reviewed this procedure, and be fully knowledgeable about the way in which the octant is mounted in the South magnet. A meeting will take place with all participants involved with this installation to review all aspects and answer any questions that any of the personnel may have. the crane operation.

3.2 All personnel involved with in this procedure shall have a safety awareness certificate.

3.3 All personnel involved in this procedure shall wear hardhats and safety shoes.

3.4 Magnet buss has been removed.

3.5 All magnet coil water hoses have been reinstalled and leak tested.

4.0 Precautions

4.1 The area where rigging operations will be performed shall be cordoned-off to all personnel except the "person in charge" and the technicians assigned to perform this procedure.

4.2 Some operations will require personnel to work in close proximity to suspended loads. Do not permit anyone to be positioned under the load.

4.3 Lift the octants with the commercial lifting fixture only and only with the protective covers in place on the octant.

5.0 Equipment List

5.1 Appropriate ANVER vacuum lifting fixture, model number ET-100M8-MR-SP, serial number 974808, rated load capacity 1000 pounds.

5.2 "C" fixture, rated load capacity 1000 pounds
5.3 Guide ropes.
5.4 Shackles rated for a minimum of 1000-pound load.

6.0 Preparation

6.1 Presurvey of the kinematic mounts and octants. See drawing 002-0212-524 B1A and B2A for kinematic mount preset adjustments.
6.2 Magnet hoses tested and leak tight.
6.3 All kinematic mounts attached to magnet back plate as shown in drawing 002-0212-526 D1,D2 and 002-0212-524 B1,B2,B3
6.4 A preliminary trial fit with a station 3 south honeycomb panel should be made by the 1008 crew and muon personnel, to understand the ability and technique needed to safely locate the 6 o'clock octant into the bottom of the magnet. This will make use of both the "C" fixture and the ANVER vacuum lifter. Having the ability of using a full-scale panel along with the required rigging will allow the 1008 crew to get a feel for how difficult working with these large chambers may be.

7.0 **Procedure**

7.1 The side with the kinematic mounts face magnet back plate. Installation proceeds from the bottom of the magnet to the top beginning at 6:00 o'clock and proceeding in order 6:00,4:30,7:30,3:00,9:00,1:30,10:30,12:00.
7.2 FIRST OCTANT ONLY _ 6:00 position
    7.2.1 Attach "C" fixture to the crane hook and attach the ANVER vacuum-lifting fixture to the "C" fixture using a shackle.
7.3 Attach the ANVER lifting fixture to the octant in the horizontal position following the manufacturer instructions. Lift the octant only after the vacuum pump has turned off. Tilt the octant to a vertical position.
    7.3.1 For the First octant at 6:00 o'clock the octant may need to be in an intermediate position between 9:00 o'clock and 6:00 o'clock, see drawings numbered 002-0212-566 sheet C1-C8.
7.4 Rotate the octant to the orientation in the "spider".
    7.4.1 For the First octant at 6:00 o'clock rotate the octant to an intermediate position as it is lowered and then rotate the to the 6:00 o'clock position.
7.5 Attach guide ropes to the octant.
7.6 Lift and lower the octant into place on the kinematic mounts. Use guide ropes to stabilize the octant during installation. Survey the octant and reset kinematic mounts if necessary.
7.7 ~~Have the survey crew look at the targets on the octant and compare the data with the pre-survey data from bldg. 905, along with drawings numbered 002-0212-566, sheets C1 – C8. It is possible to make small adjustments to the kinematic mounts. It will be necessary to remove the octant from the wall to get access to these mounts for location adjustment.~~ BJK 7/12/00

8.0 Alignment of octants, alignment system

8.1 The survey crew will verify the location of all targets placed on the upstream face of each octant as part of their installation, ~~see 7.7~~ RJK 7/17/08

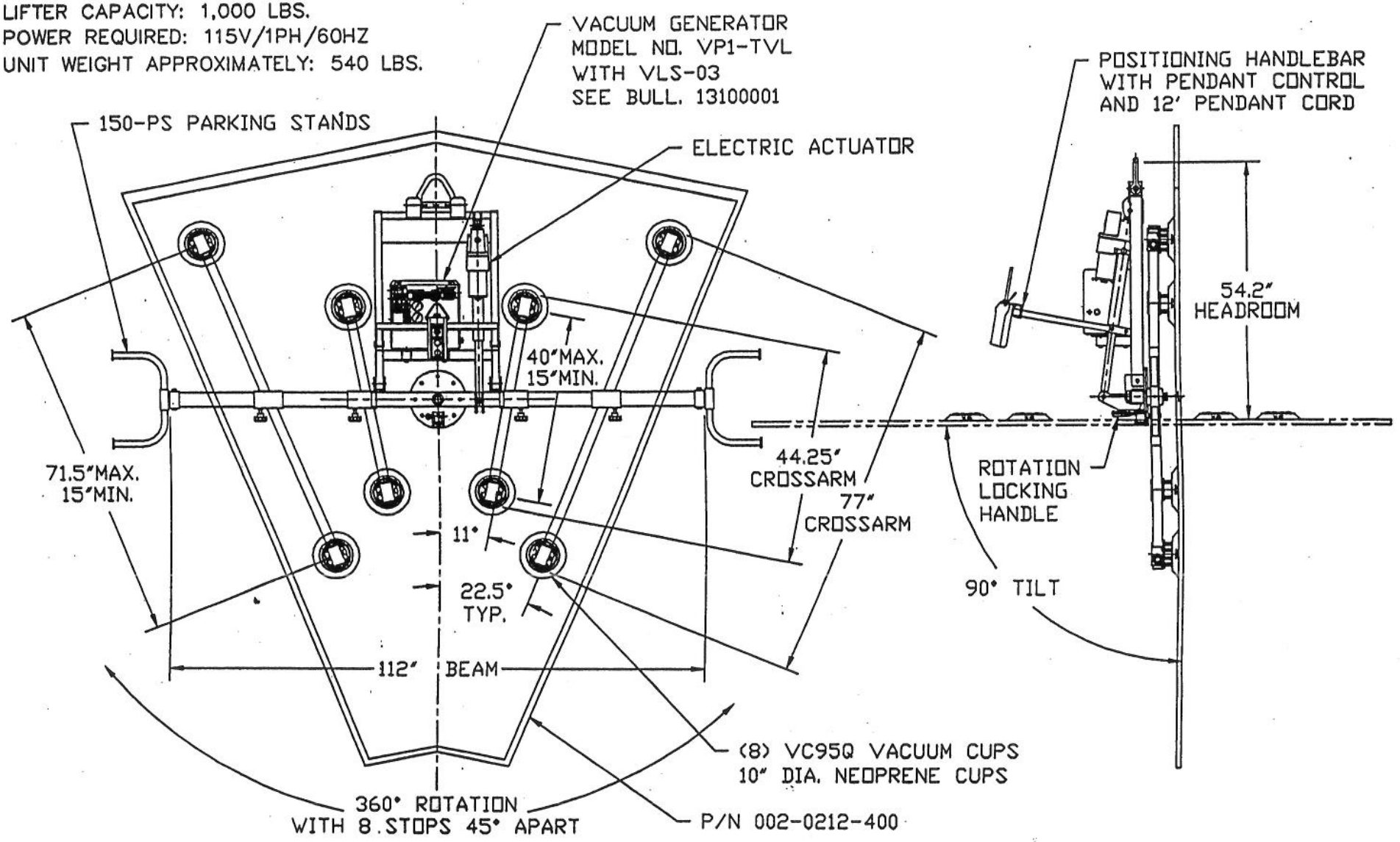
8.2 Install the camera mounts and cameras to the brass flags located around the outer edge of each octant according the drawings numbered 002-0212-564 and 565.

ANVER CORPORATION
36 PARMENTER ROAD
HUDSON, MA 01749 USA
508-568-0221 • 800-654-3500
FAX 508-568-1570

ELECTRIC TILTER NO. 820 00 090
MODEL NO. ET100M8-MR-SP

Doc. No. 821 00 090
Revision: A
Effective Date: Nov. 12, 1997

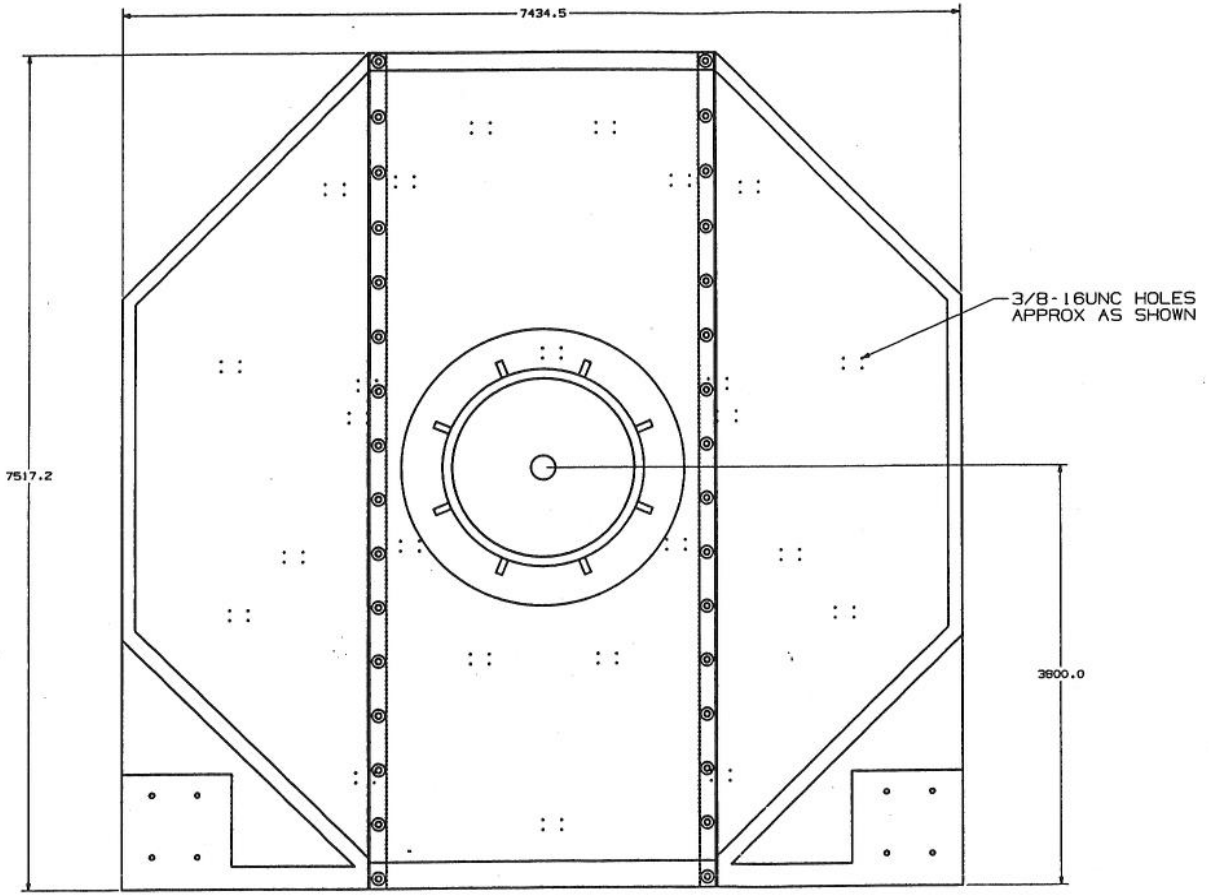
MAXIMUM LOAD SIZE: 11.5 FT. x 11 FT.
LIFTER CAPACITY: 1,000 LBS.
POWER REQUIRED: 115V/1PH/60HZ
UNIT WEIGHT APPROXIMATELY: 540 LBS.



Supersedes:

FORM: MDRZ PLOT SCALE 1 = 30

Classification: SPEC. SHEETS



MUON SOUTH MAGNET BACKPLATE

SHOWING REAR COIL AND DETECTOR
MOUNTING HOLES

NOTE-
1. NOT ALL BACKPLATE HOLES ARE REPRESENTED IN THIS VIEW.

NOV 0 8 1999

ORIGINAL ISSUE

Los Alamos
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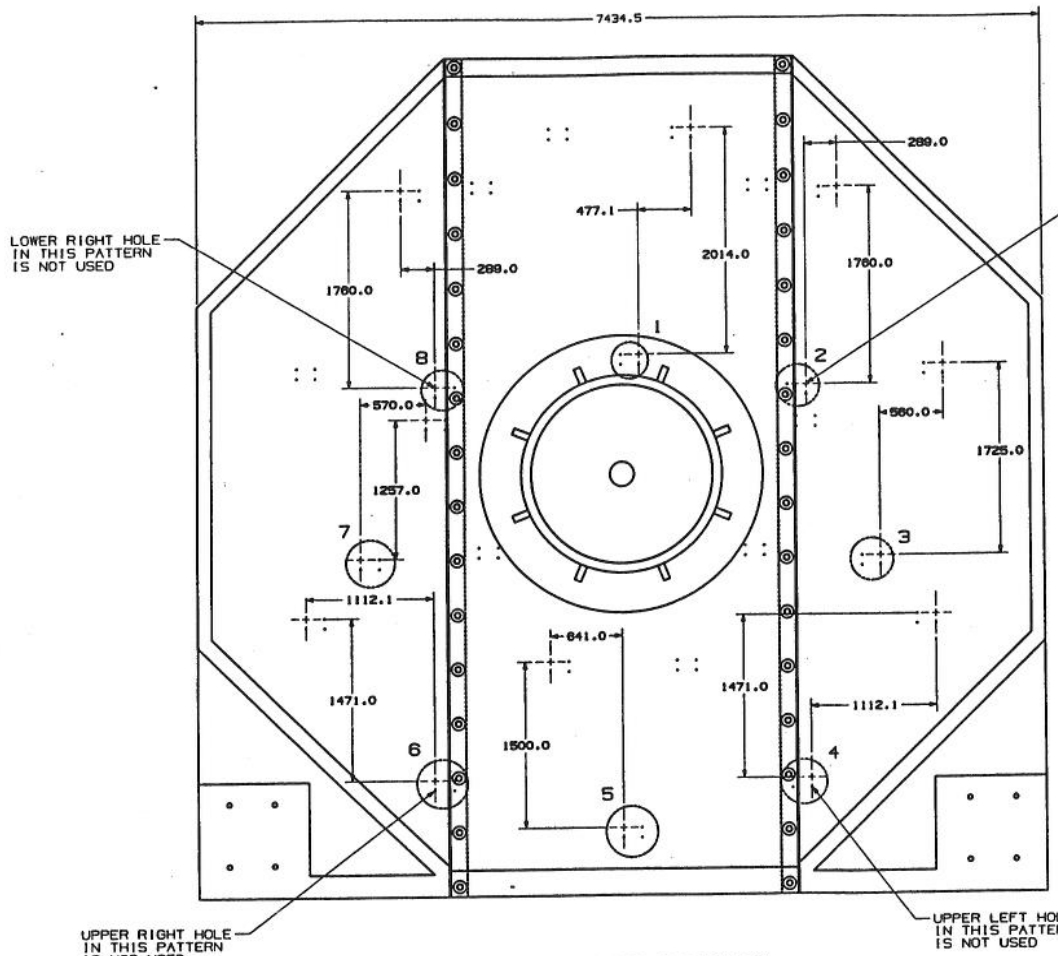
	SIGNATURE	DATE	GROUP
DRAWN	CLARK	8-99	P-25

MUON SOUTH MAGNET BACKPLATE
SHOWING REAR COIL AND
DETECTOR MOUNTS

PHENIX DRAWING NO. 002-0212-526

NONE

126Y-267773 D 1



MUON SOUTH MAGNET BACKPLATE

SHOWING REAR COIL AND DETECTOR MOUNTING HOLES

NOTE: HOLE PATTERN LOCATIONS 1, 2, 3 & 4 REFERENCE THE UPPER RIGHT BOLT HOLE. LOCATIONS 5, 6, 7 & 8 REFERENCE THE UPPER LEFT BOLT HOLE

THE RECTANGULAR HOLE PATTERN IS THE SAME AS THE OTHERS, 89.9 X 165.1

DENOTES "Z" KINEMATIC MOUNT

ALL DIMENSIONS IN MILLIMETERS

NOTE-
1. NOT ALL BACKPLATE HOLES ARE REPRESENTED IN THIS VIEW.

APR 12 2000

ORIGINAL ISSUE

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MUON SOUTH MAGNET BACKPLATE
SHOWING REAR COIL AND DETECTOR MOUNTS

PHENIX DRAWING NO. 002-0212-526

SCALE: NONE

126Y-267773 D 2

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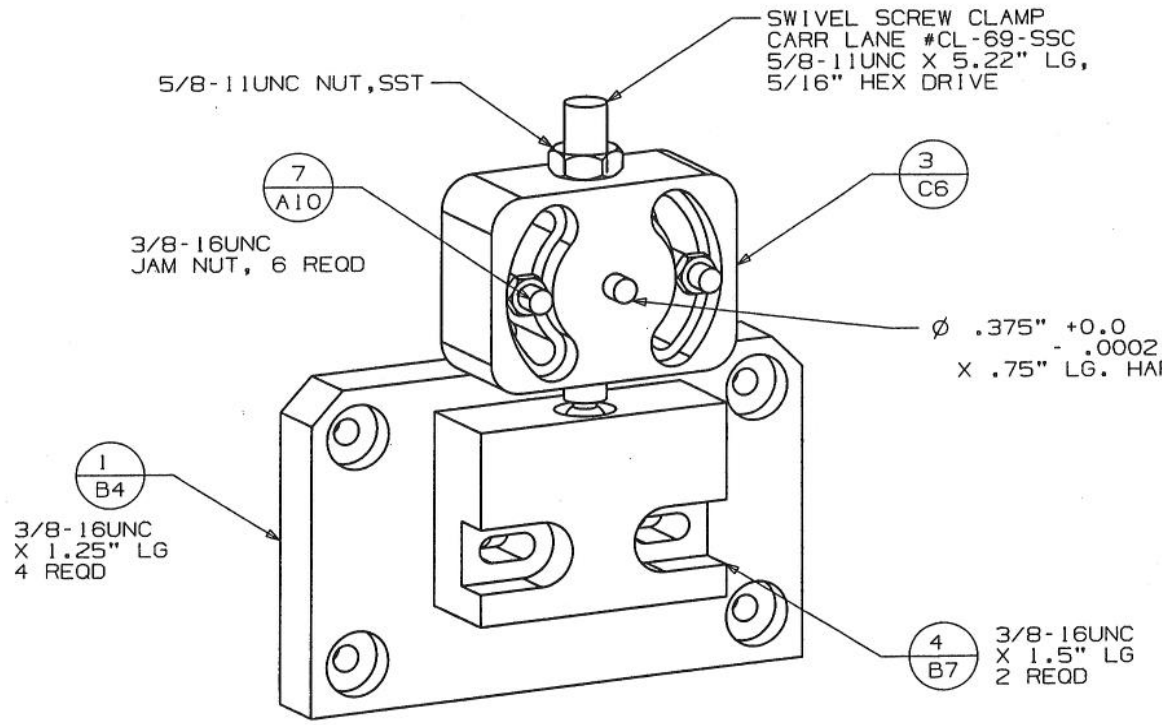

NOTE

1. ORIENTATION OF 3/8 THR. ROD MAY VARY.

SUPPORT CONE ASSY

8 REQD

X & Y ADJUSTMENT

W.S. AUG 20 1999

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.X=± ____ 0.XXX=± ____ FIN= ____

TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT CONE ASSY

PHENIX DRAWING NO. 002-0212-524

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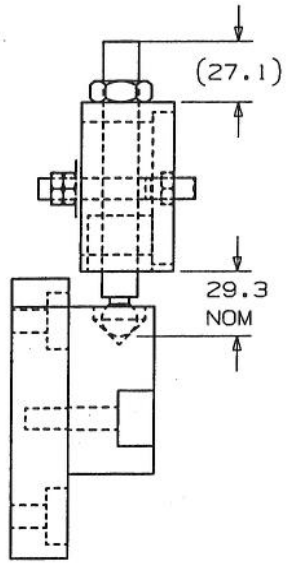

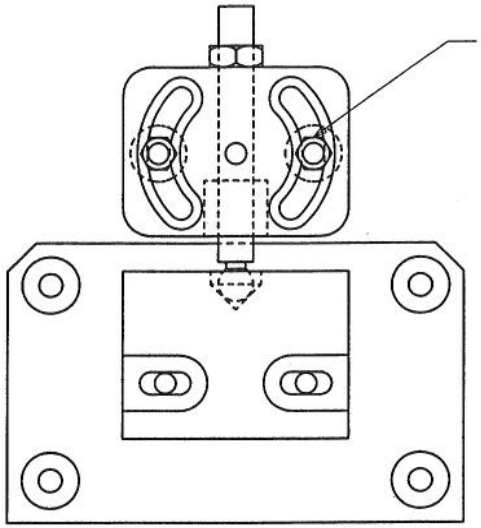

NOMINAL SETTING FOR KINEMATIC MOUNT
SUPPORT CONE ASSY

APR 17 2000

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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT CONE ASSY

PHENIX DRAWING NO. 002-0212-524

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	NO.
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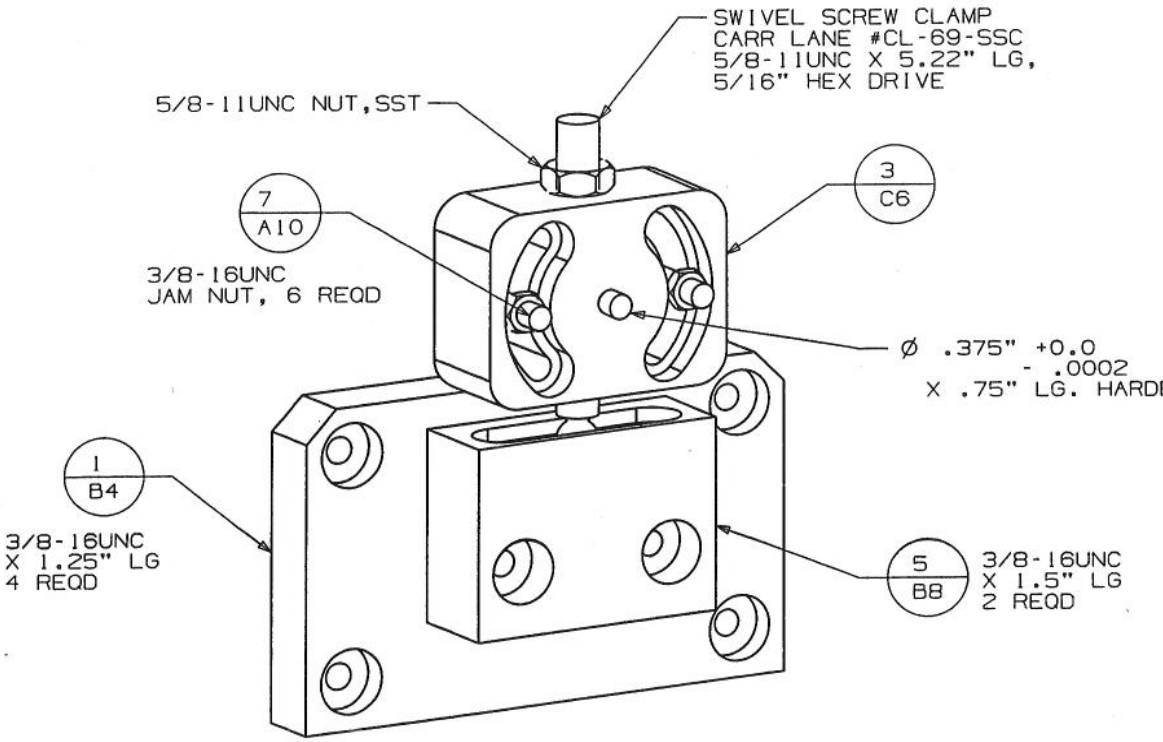
NOTE

1. ORIENTATION OF 3/8 THR. ROD MAY VARY.



SUPPORT SLIDE ASSY

8 REQD

Y ADJUSTMENT
X FREEDOM

U.S. AUG 20 1999

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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT SLIDE ASSY

PHENIX DRAWING NO. 002-0212-524

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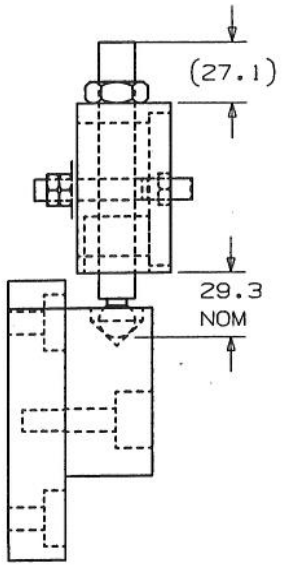

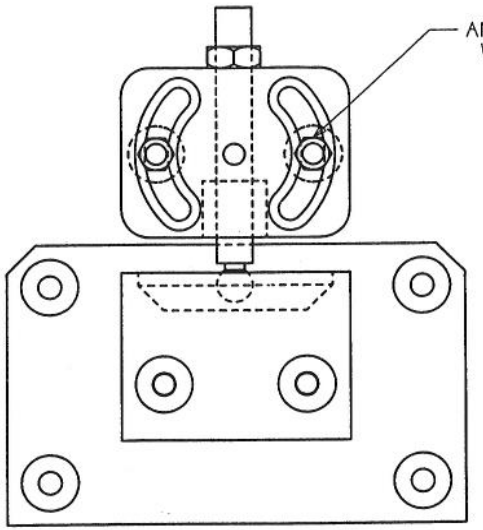

NOMINAL SETTING FOR KINEMATIC MOUNT

SUPPORT SLIDE ASSY

WJ APR 17 2000

CLASSIFICATION: DRAWING: PART: TITLE BLOCK:

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TOLERANCE-(UNLESS OTHERWISE NOTED)
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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT SLIDE ASSY

PHENIX DRAWING NO. 002-0212-524

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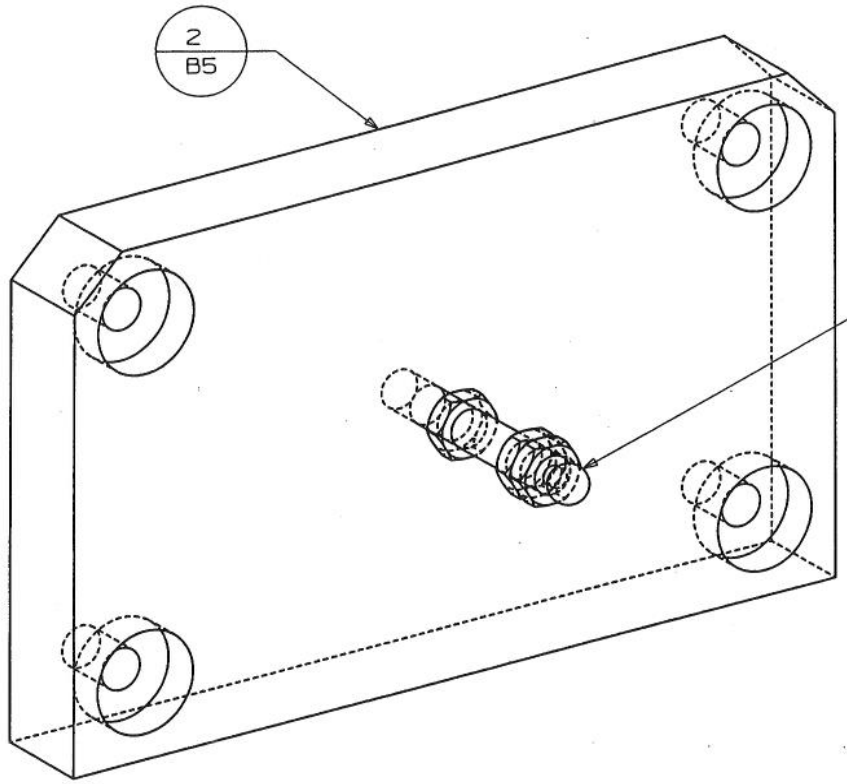

SUPPORT STOP ASSY

8 REQD

Z ADJUSTMENT
Y FREEDOM
X FREEDOM

W.S. AUG 20 1999

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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT STOP ASSY

PHENIX DRAWING NO. 002-0212-524

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	NO.
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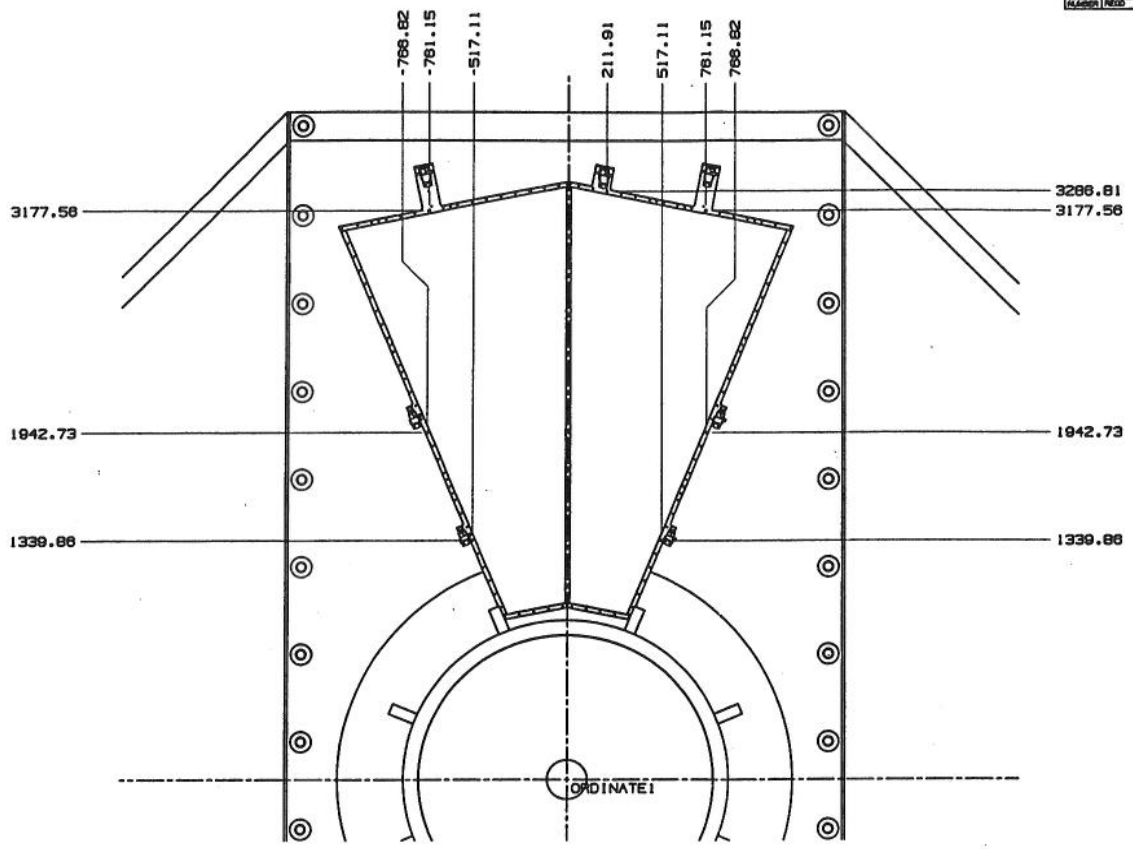

VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

ITEM NUMBER	NUMBER REQD	DESCRIPTION

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TOLERANCE: (UNLESS OTHERWISE NOTED)
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TITLE
MUON STATION 3 SOUTH
LOCATING PINS,
TOP

PHENIX DWG NO. 002-0212-566

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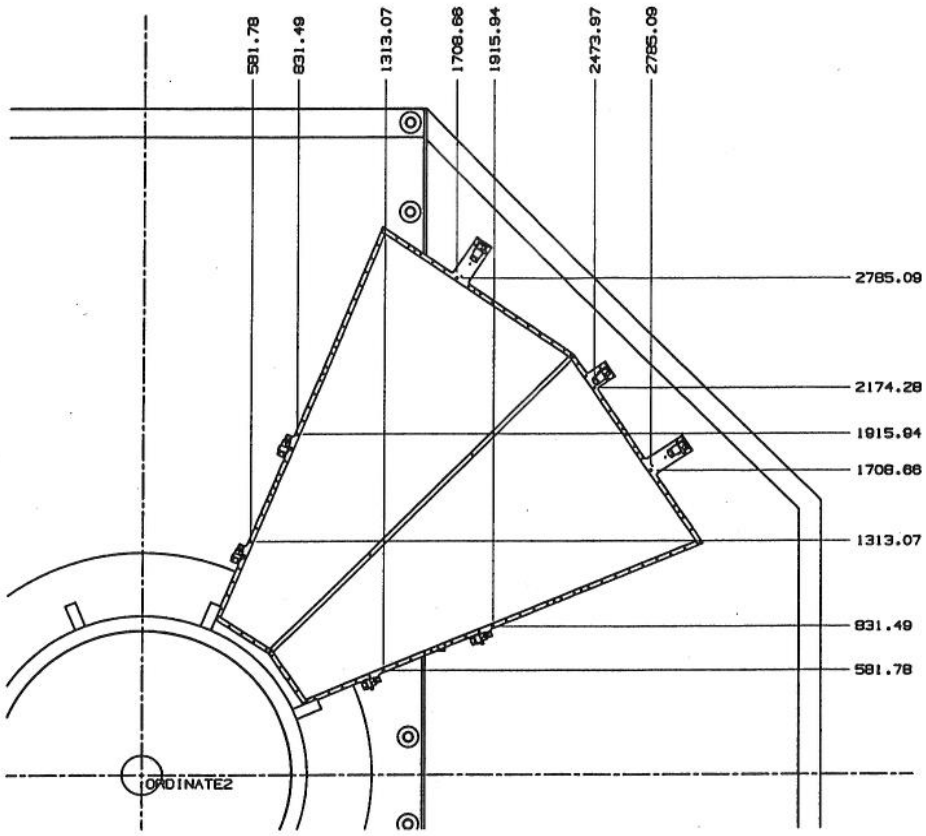
APR 12 2000



VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

U.S. APR 12 2000

ITEM NUMBER	NUMBER REQD	DESCRIPTION

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TOLERANCE- UNLESS OTHERWISE NOTED:
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.XX± ____ 0.0005 FIN± ____

TITLE
MUON STATION 3 SOUTH
LOCATING PINS,
TOP SIDE R

PHENIX DWG NO. 002-0212-568

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	REV. NO.
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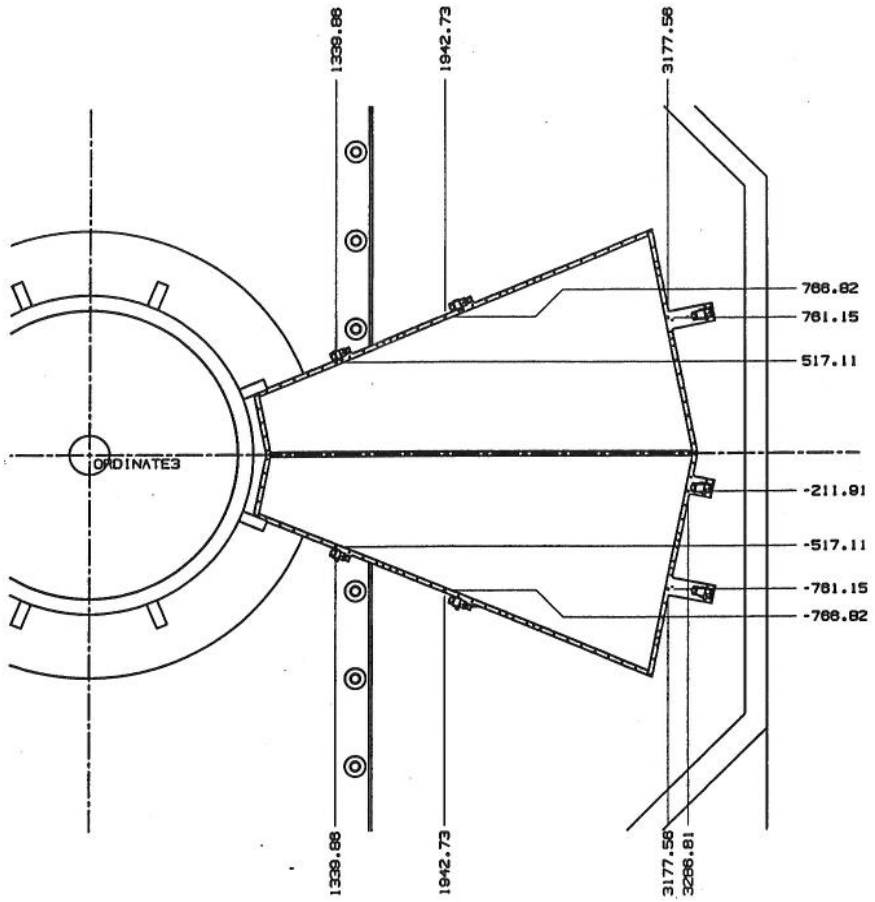

VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

W. S. APR 12 2000

ITEM NUMBER	NUMBER REQD	DESCRIPTION

CLASSIFICATION: DRAWING: PART: TITLE BLOCK:

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TOLERANCE- UNLESS OTHERWISE NOTED:
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TITLE: MUON STATION 3 SOUTH LOCATING PINS, SIDE R

PHENIX DWG NO. 002-0212-566

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	REV. NO.
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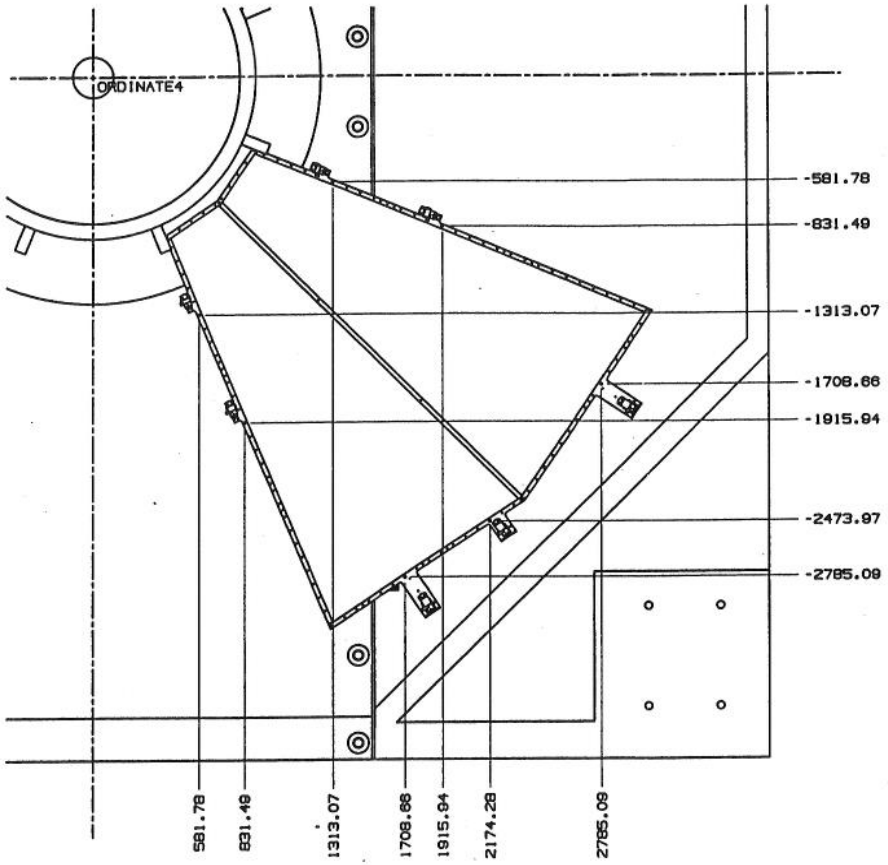

VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

W.S. APR 12 2000

ITEM NO.	NUMBER REQD	DESCRIPTION

REV	CLASS REVISION	REVISIONS	DATE	DRAWN BY	CHECKED BY	APPROVED BY
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TOLERANCE-UNLESS OTHERWISE NOTED:
X=± ___ @.XX=± ___ ANG=± ___
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TITLE: MUON STATION 3 SOUTH LOCATING PINS, BOT SIDE R

PHENIX DWG NO. 002-0212-568

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	NO.
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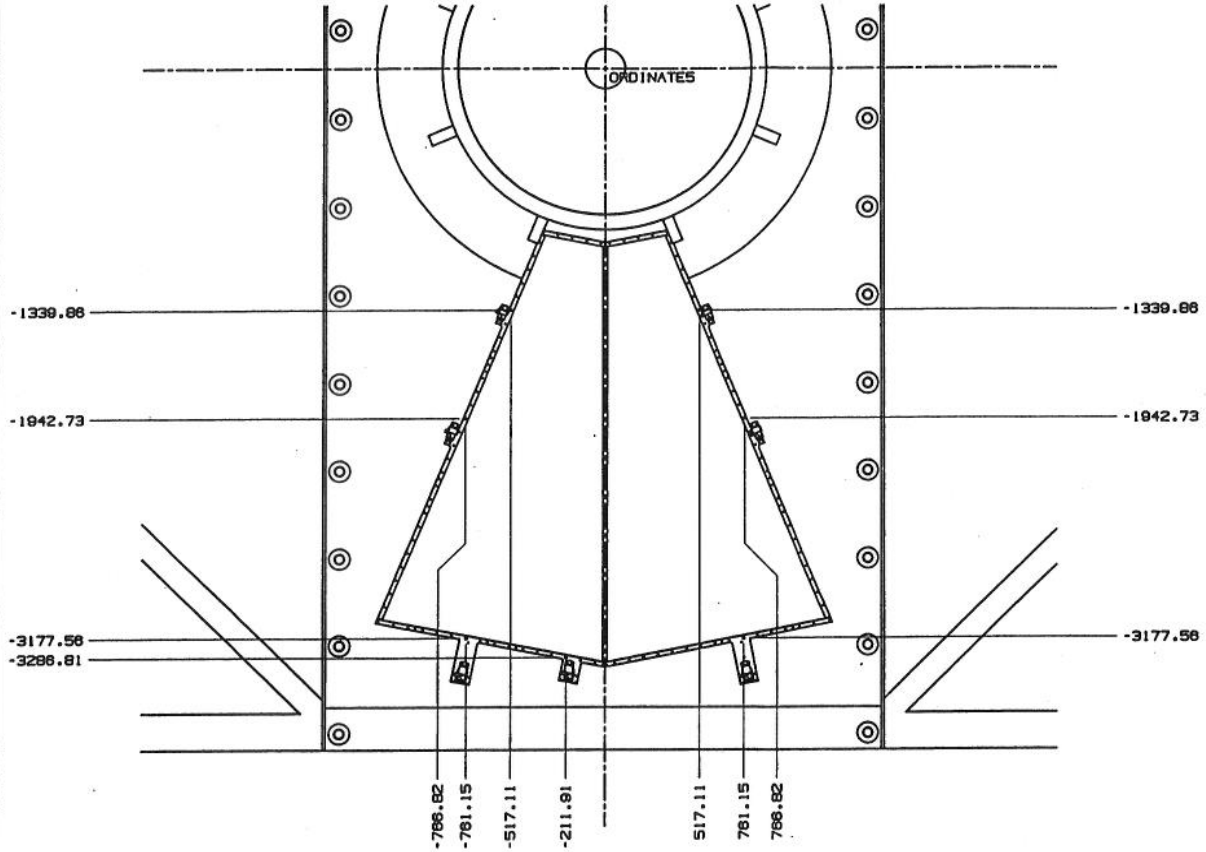
ITEM NUMBER	NUMBER REQD	DESCRIPTION



VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

APR 12 2000

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TITLE: MUON STATION 3 SOUTH LOCATING PINS, BOT

PHENIX DWG NO. 002-0212-566

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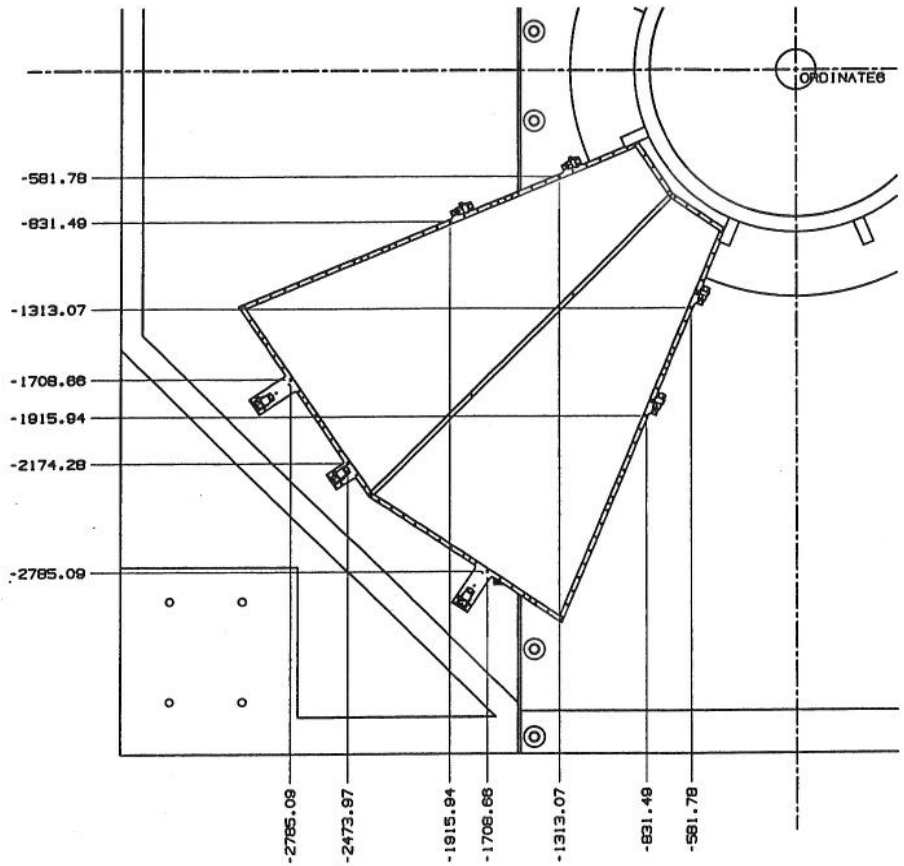

VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

W. S. APR 1 2 2000

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TOLERANCE- (UNLESS OTHERWISE NOTED)
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TITLE
MUON STATION 3 SOUTH
LOCATING PINS,
BOT SIDE L

PHENIX DWG NO. 002-0212-566

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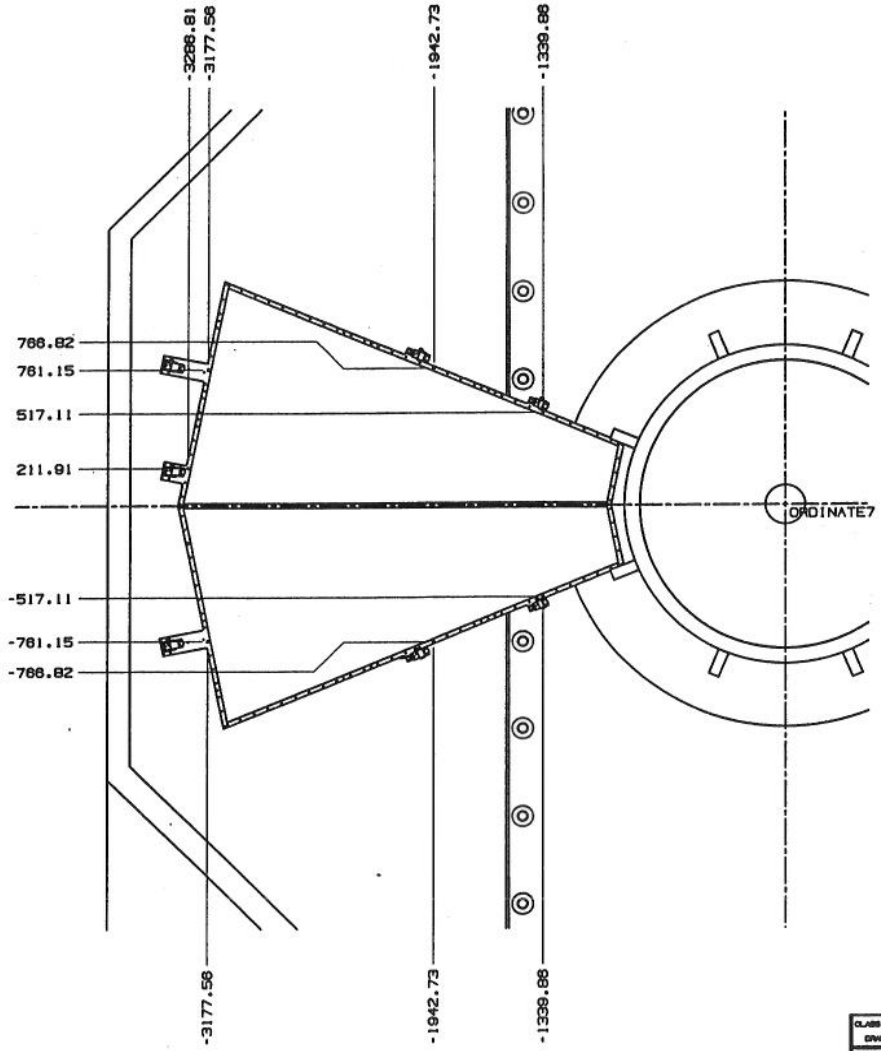


VIEW SHOWS ORDINATE DIMENSIONS FOR (7) LOCATING PINS

D, 3 APR 12 2000

ITEM NUMBER	NUMBER REQD	DESCRIPTION

REV	CLASS REVIEW	ORIGINAL ISSUE	DATE	CHANGED BY	CHECKED BY	APPROVED BY
		REVISIONS				

CLASSIFICATION: DRAWING: PART: TITLE BLOCK:

	SIGNATURE	DATE	GROUP
ORIG			
DRAWN	CLARK	4/00	P-25
CHECKED			
PROJ ENGR			
APPROVED			
RELEASED			

LOS ALAMOS
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO, 87545

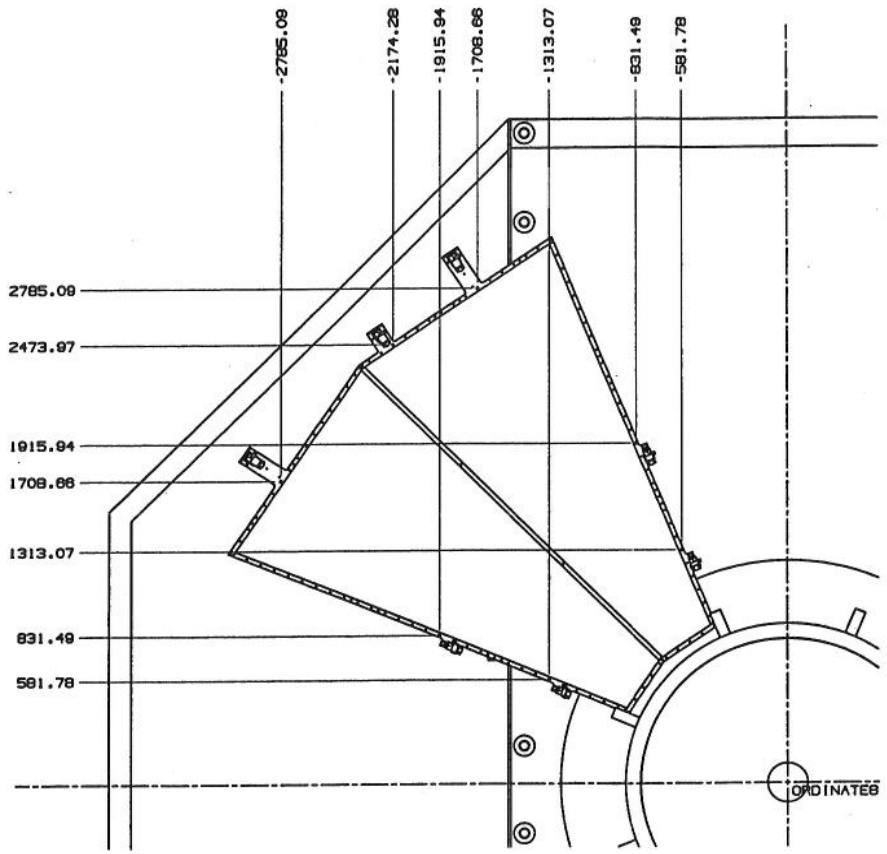
TOLERANCE- UNLESS OTHERWISE NOTED:
X=± ___ .XX=± ___ ANG=± ___
.XX=± ___ .XXX=± ___ FIN= ___

TITLE: MUON STATION 3 SOUTH LOCATING PINS, SIDE L

PHENIX DWG NO. 002-0212-568

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	REV. NO.
.08		128Y-267796	C	7

ITEM NUMBER	NUMBER REQD	DESCRIPTION



VIEW SHOWS ORDINATE DIMENSIONS
FOR (7) LOCATING PINS

U.S. APR 12 2000

CLASSIFICATION: DRAWING: PART:		TITLE BLOCK:	
	SIGNATURE	DATE	GROUP
ORIG			
DRAWN	CLARK	4/00	P-25
CHECKED			
PROJ ENGR			
APPROVED			
RELEASED			

REV	LETTER REVISED	REVISIONS	DATE	CHANGED BY	CHECKED BY	APPROVED BY
—	—	ORIGINAL ISSUE	—	—	—	—

LOS ALAMOS
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO, 87545

TOLERANCE (UNLESS OTHERWISE NOTED): X=± 0.XX ± ANG=± Y=± 0.XXX± FIN=

TITLE: MUON STATION 3 SOUTH LOCATING PINS, TOP SIDE L

PHENIX DWG NO. 002-0212-586

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	REV NO.
.08		126Y-267798	C	8

PHENIX

PHENIX MuTr SOUTH SPIDER INSTALLATION PROCEDURE

procedure name

PHENIX Procedure No. PP-2.5.5.4-12

Revision: A **Date: 4-28-00**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approvals

5/10/00
PHENIX S E & I Date

8 May 00
Cognizant Scientist/Engineer Date /Activity Manager

5/8/00
PHENIX Safety Date

CA-D ES&H /SAFETY Date

IN HOUSE PROCEDURE

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	4/28/2000	n/a	P. Kroon, (1 unintelligible), W. Lenz	n/a
RETIRED	Installation Completed	3/20/2007	n/a	D. Lynch, P. Giannotti, R. Pisani for PHENIX	D. Lynch

Station 2 South Spider Installation Procedure PP-2.5.5.4-12

1.0 Purpose and Scope

1.1 The purpose of this procedure is to provide direction for the rigging of the station 2 south support "spider". This structure locates all eight station 2 detectors in the South muon magnet. This procedure will provide detailed instructions for the safe installation of the support "spider" onto its mounting location off the back of the "teacup" and flanges on the bottom three lampshade panels.

Note that the weight for each half of the "spider" is 350 pounds. Each spanner weldment bar is an additional 30 pounds.

2.0 Responsibilities

2.1 All operations shall be performed under the direction of the PHENIX experimental hall "person-in-charge", or their designee.

2.2 Due to the delicacy of this structure, and the critical alignment of its assembly in the magnet, this procedure and all relevant BNL safety guidelines must be strictly adhered to. In accordance with BNL policy, any individual may cease operations if they in any way feel unsafe or if they believe unsafe procedures are being followed, such a complaint shall be reviewed by the cognizant engineer, and if necessary, BNL ES&H Services.

2.3 A member of the muon tracking mechanical team should be present for all critical lifts, to consult on procedures and answer any questions as they may arise.

3.0 Prerequisites

3.1 Training: All personnel involved in this procedure shall have reviewed this procedure, and be fully knowledgeable about the way in which the support "spider" is assembled in the South magnet. A meeting will take place with all participants involved with this installation to review all aspects and answer any questions that any of the personnel may have.

3.2 All personnel involved with in this procedure shall have a safety awareness certificate.

3.3 All personnel involved in this procedure shall wear hardhats and safety shoes.

3.4 Magnet power buss must be removed.

4.0 Precautions

4.1 The area where rigging operations will be performed shall be cordoned-off to all personnel except the "person in charge" and the technicians assigned to perform this procedure.

4.2 Some operations will require personnel to work in close proximity to suspended loads. Do not permit anyone to be positioned under the load.

4.3 Lift half spiders only by the swivel eyes attached to the hub. (See drawings numbered 002-0212-260, sheets D2, D3, D4 and D5.

5.0 Equipment List

5.1 Appropriate slings for lifting 1000 pounds and shackles

5.2 Two-3/8-16 lifting swivel eyes (supplied by Ray Savino) – Jergens part # 23408 rated for 1000 pounds each.
5.3 Guide ropes. May be attached to outer bars to help stabilize.
5.4 Torque wrench.

6.0 Preparation

6.1 Mount 12 FR4 support brackets to top half of spider using 3/8-16 x 1-3/4 inch stainless steel socket head cap screws (provided by Ray Savino). Drawing number 002-0212-262 D1. On the lower half spider attach FR4 brackets as called out on drawing 002-0212-260 D1. On the two splice tube weldments attach 6 FR4 brackets as indicated on drawing 002-0212-260-D1. Torque for a 3/8-16 stainless steel bolt is 236 in-lbs.

6.2 For each half spider install 9-3/8-16 x 2 inch long set screws where indicated on the hub on drawing 002-0212-260 D4-5.

6.3 Place the bottom half of the spider in the bottom of the magnet. Attach two slings to two swivel eyes screwed into the center hub. Attach a rope to the outer cross bar that match the 6 o'clock octant to stabilize and to pull across from the underside of the piston. Lower the bottom half of the spider along the side of the bottom lampshade panel and pull the rope so that this piece will lay flat in the bottom of the magnet. It will need to be rotated so that it can be lifted up from the bottom of the magnet, after the top half is installed. See 7.2.

7.0 Procedure

7.1 Top half spider

7.1.1 The spokes are on the upstream side of the assembly. The hub extends in the downstream direction towards the magnet back plate.

7.1.2 Attach two slings, in a choker around the interface of the three legs that would be on either side of the 12 o'clock octant.

7.1.3 Attach guide ropes to stabilize the piece from rotating. Note: for 7.1.2 and 7.1.3 see drawings numbered 002-0212-260, sheet D2.

7.1.4 Lift and lower the top half spider into place and attach to the teacup at the outside boundary using two ½-13 stainless steel bolts per FR-4 block, these screws will be tightened later in the assembly process. Put set screws into the hub at 6 locations to support the hub off of the piston.

7.2 Bottom half spider.

7.2.1 The spokes are in the upstream side of the assembly. The hub extends in the downstream direction.

7.2.2 Attach four swivel eyes to the hub in the upstream, (spoke side) location where the two halves join together and attach a sling to each of the pair of swivel eyes and run up on either side of the piston.

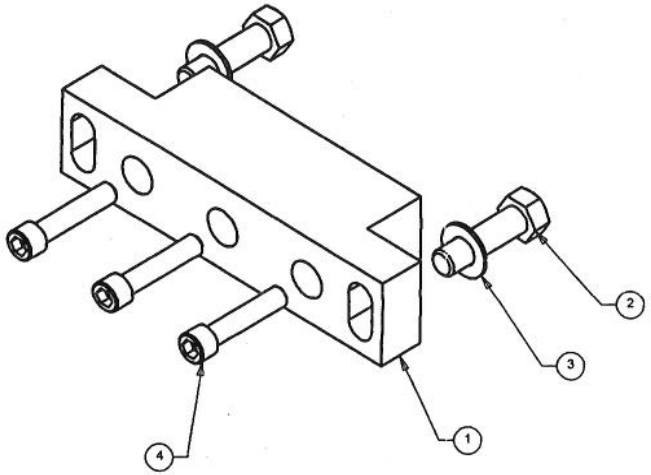
7.2.3 On either side a 1/8 inch aluminum spacer is placed between the two half hubs. Install 3/8-16 socket head screws and tighten to 236 in-lbs. Attach outer spider to the tea cup flange using two ½-13 stainless steel bolts per FR-4 block, do not tighten.

7.2.4 Install splice tubes as shown on drawing 002-0212-260 sheet D1. Use long 3/8-16 bolts to make connection with top and bottom halves of the spider. Torque 3/8-16 stainless steel bolts to 236 in-lbs.

8.0 Alignment

8.1 Survey crew can make some small adjustments to the location of the spider, once the two halves are bolted together, using the long setscrews that go through the hub to the piston notch. After the spider is located correctly, tighten all ½-13 bolts around the perimeter to the teacup and lampshade panels to a torque of 517 in-lbs. remove the setscrews from the hub to the piston. Measure continuity to the piston to make sure that the piston is not in electrical contact with the spider.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL
1	1	002-0212-262-D2	Support Block	
2	1		Hex Hd Screw, 1/2-13 UNC-2A X 1.75 lg.	SST
3	1		Flat Washer, 1/2	SST
4	4		Soc Hd Screw, 3/8-16 UNC-2A X 1.75 lg.	SST

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

W.S. OCT 13 1999

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE MILLIMETERS
-TOLERANCES-
DECIMALS
X ± .25
.X ± .25
.XX ± .25
ANGULAR ± .25°
SURFACE FINISH 3.2

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE
DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212-262-D1-1

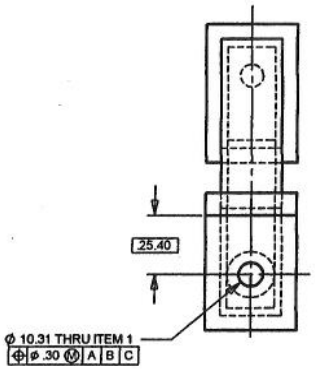
	SIGNATURE	DATE
DESIGNED	Roger L. Smith	7-14-99
DRAWN	Roger L. Smith	7-14-99
CHECKED	Walt Sandheis	10-08-99
ENG'R	Walt Sandheis	10-08-99
APPROVED	Walt Sandheis	10-08-99

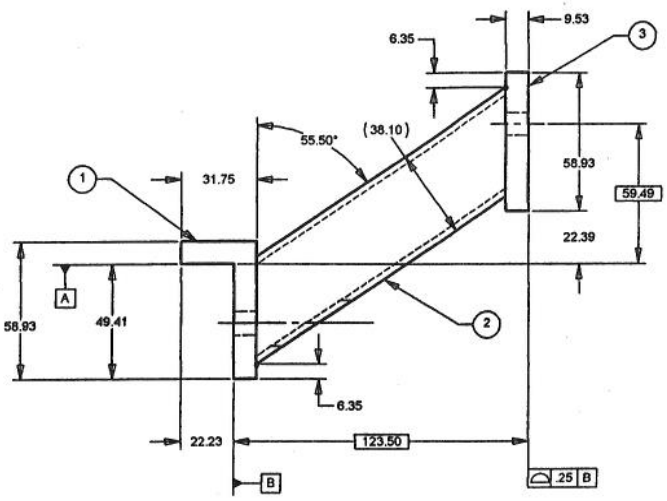
HYTEC, INC

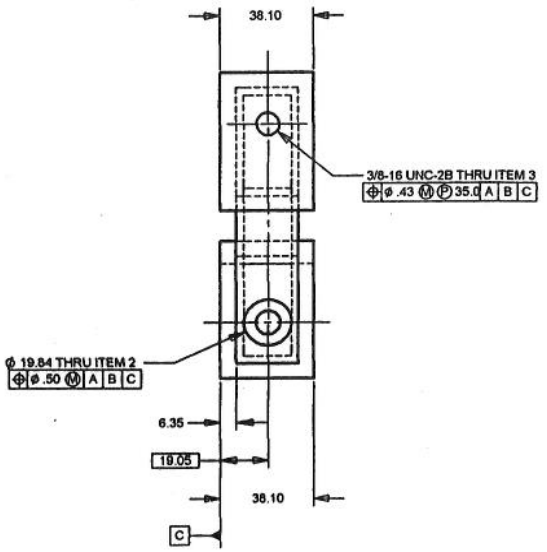
PHENIX STATION 2 SOUTH
SPIDER
SUPPORT BRACKET ASSY

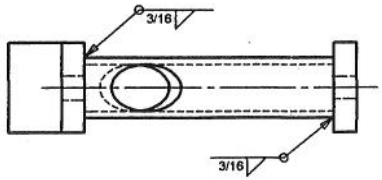
002-0212-262 D 1

SCALE 1/1









NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

W.S. OCT 13 1999

ITEM NO.	QTY.	DESCRIPTION	MATERIAL
1	1	Angle	SST-304
2	1	Rectangular Tubing 1.6" X 1.0" X .120" wall	SST-304
3	1	Plate	SST-304

PARTS LIST

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS X = ±0.25, .X = ±0.25, .XX = ±0.25 ANGULAR = ±0.35° SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

	DRAWN	DATE
DESIGNED	Roger L. Smith	7-13-99
DRAWN	Roger L. Smith	7-13-99
CHECKED	Walt Sondheim	10-05-99
ENGR	Walt Sondheim	10-05-99
APPROVED	Walt Sondheim	10-05-99

PART NO. 002-0212-261-D1-1

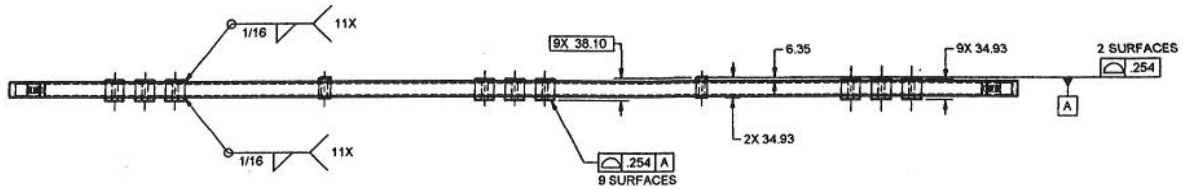
HYTEC, INC

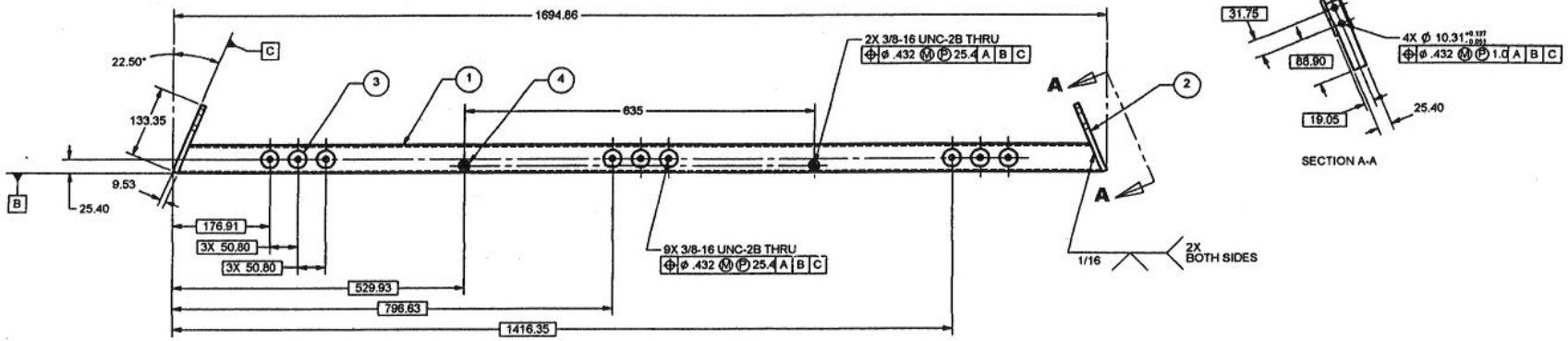
PHENIX STATION 2 SOUTH SPIDER INNER DETECTOR STABILIZER

DWG NO. 002-0212-261 SIZE D SHEET NO. 1

SCALE 1/4

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED





ITEM NO.	QTY.	DESCRIPTION	MATERIAL
1	2	Rectangular Tubing 2" X 1" X .120" wall	SST-304
2	2	End Mounting Plate	SST-304
3	9	Round Plug 1.25" Diameter	SST-304
4	2	Round Plug .75" Diameter	SST-304

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

W.S. OCT 13 1999

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: DECIMALS X. = +/- .25, .X = +/- .25, .XX = +/- .25; ANGULAR = +/- .25°; SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	6-24-99
DRAWN	Roger L. Smith	6-24-99
CHECKED	Walt Sondheim	10-08-99
ENGR	Walt Sondheim	10-08-99
APPROVED	Walt Sondheim	10-08-99

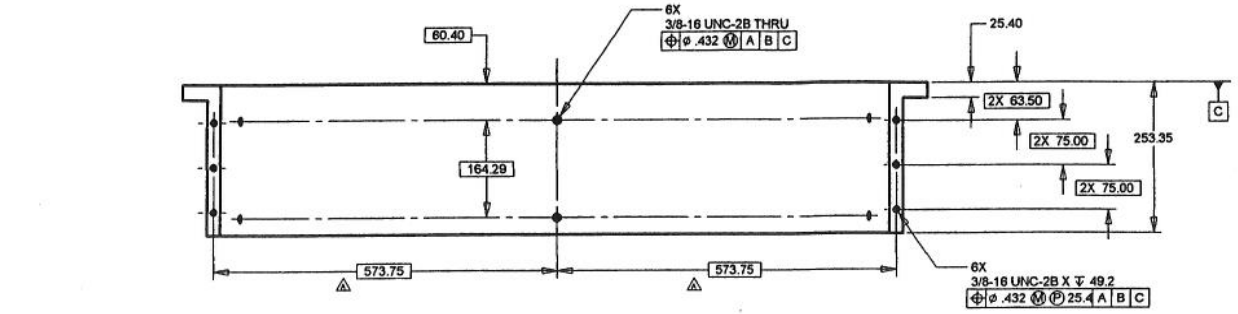
PART NO. 002-0212-260-D6-1

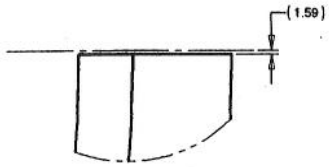
HYTEC, INC

PHENIX STATION 2 SOUTH SPIDER SPLICE TUBE WELDMENT

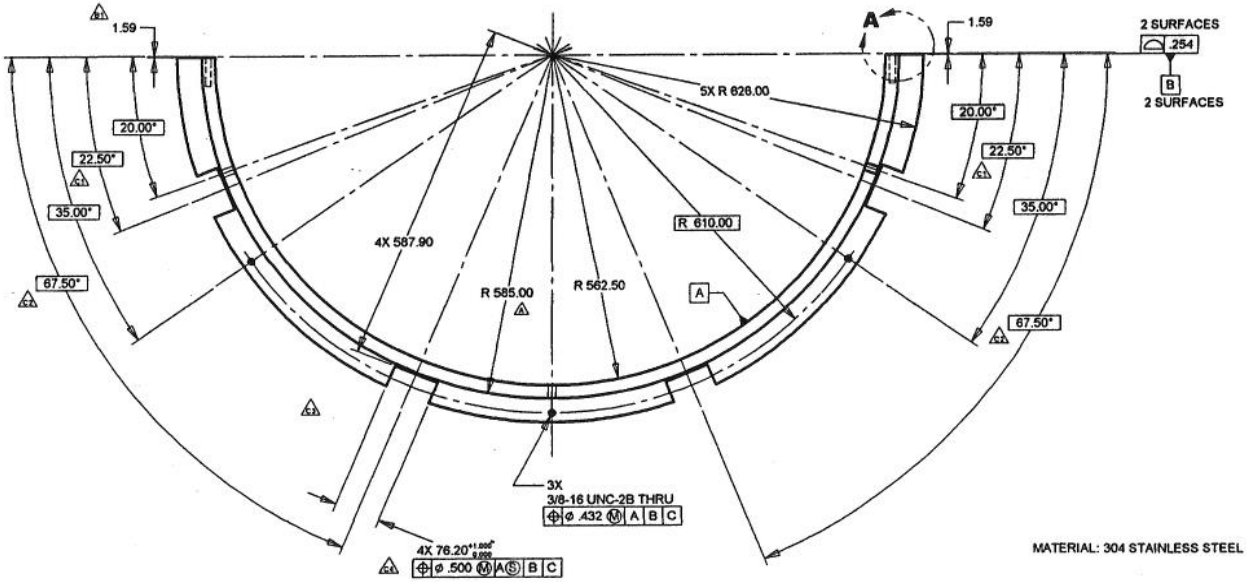
002-0212-260 D 6

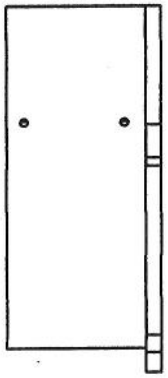
SCALE 1/4





DETAIL A
SCALE 1 : 1





MATERIAL: 304 STAINLESS STEEL

REVISIONS				
REV	ZONE	DESCRIPTION	DATE	APPROVED
A	D7	573.75 was 576.25	11/12/1999	Walt Sondheim
	D8	573.75 was 574.31		
	B8	586.25 was 587.50		
B1	C8	Added Ø1.59 dimension		
B2		All angle dimensions were to datum surface now to are centerline	3/6/2000	Walt Sondheim
B3	D8	Added detail view A for clarity		
B4	A8	Note 3 was ANSI is now ASME Y14.5M -1994		
C1	C4,C6	22.50 deg now Basic		
C2	B4,B8	67.50 deg now Basic	4/12/2000	Walt Sondheim
C3	B7	Re-moved dX 39.10		
C4	A6	Added .500 Positional Tol to Slot		

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ASME Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

WS APR 20 2000

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS X = ±0.25, .X = ±0.10, .XX = ±0.25 ANGULAR = ±0.25° SURFACE FINISH = 3.2

FINISH

PART NO. 002-0212-260-D5-1

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE
DO NOT SCALE DRAWING

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	6-24-99
DRAWN	Roger L. Smith	6-24-99
CHECKED	Walt Sondheim	10-06-99
ENGR	Walt Sondheim	10-06-99
APPROVED	Walt Sondheim	10-06-99

HYTEC, INC

TITLE
PHENIX STATION 2 SOUTH
SPIDER
LOWER SUPPORT RING

DWG NO. 002-0212-260 SIZE D SHEET NO. 5

SCALE 1/4 REVISION C

REVISIONS				
REV	ZONE	DESCRIPTION	DATE	APPROVED
A	C6	573.75 was 575.30	11/12/1999	Walt Sandholm
	C6	573.75 was 576.21		
	D5	586.20 was 587.80		
B1	C7	Added 1.59 dimension		
B2		All angle dimensions were to datum surface now to arc centerline	3/6/2000	Walt Sandholm
B3	D3	Added detail view A for clarity		
B4	A6	Note 2 was ANSI is now ASME Y14.5M -1994		
C1	C5,C6	22.50 deg now Basic		
C2	B3,D6	67.50 deg now Basic	4/12/2000	Walt Sandholm
C3	D6	Removed 4X 36.10		
C4	A6	Added .500 Positional Tol to Slot		

6X
3/8-16 UNC-2B THRU
⌖ ø .432 Ⓜ A B C

60.40

25.40

2X 63.50

2X 75.00

2X 75.00

253.35

164.29

573.75

573.75

6X
ø 10.31 THRU
⌴ ø 19.05 FROM FAR SIDE
⌖ ø .305 Ⓜ A B C

(1.59)

DETAIL A
SCALE 1 : 1

1.59

49.21

20.00°

22.50°

35.00°

67.50°

R 626.00

4X 587.90

R 585.00

R 562.50

R 610.00

1.59

2 SURFACES
⌓ .254
B
2 SURFACES

20.00°

22.50°

35.00°

67.50°

3X
3/8-16 UNC-2B THRU
⌖ ø .432 Ⓜ A B C

4X 76.20 +.000 -.020
⌖ .500 Ⓜ A Ⓢ B C

SECTION B-B

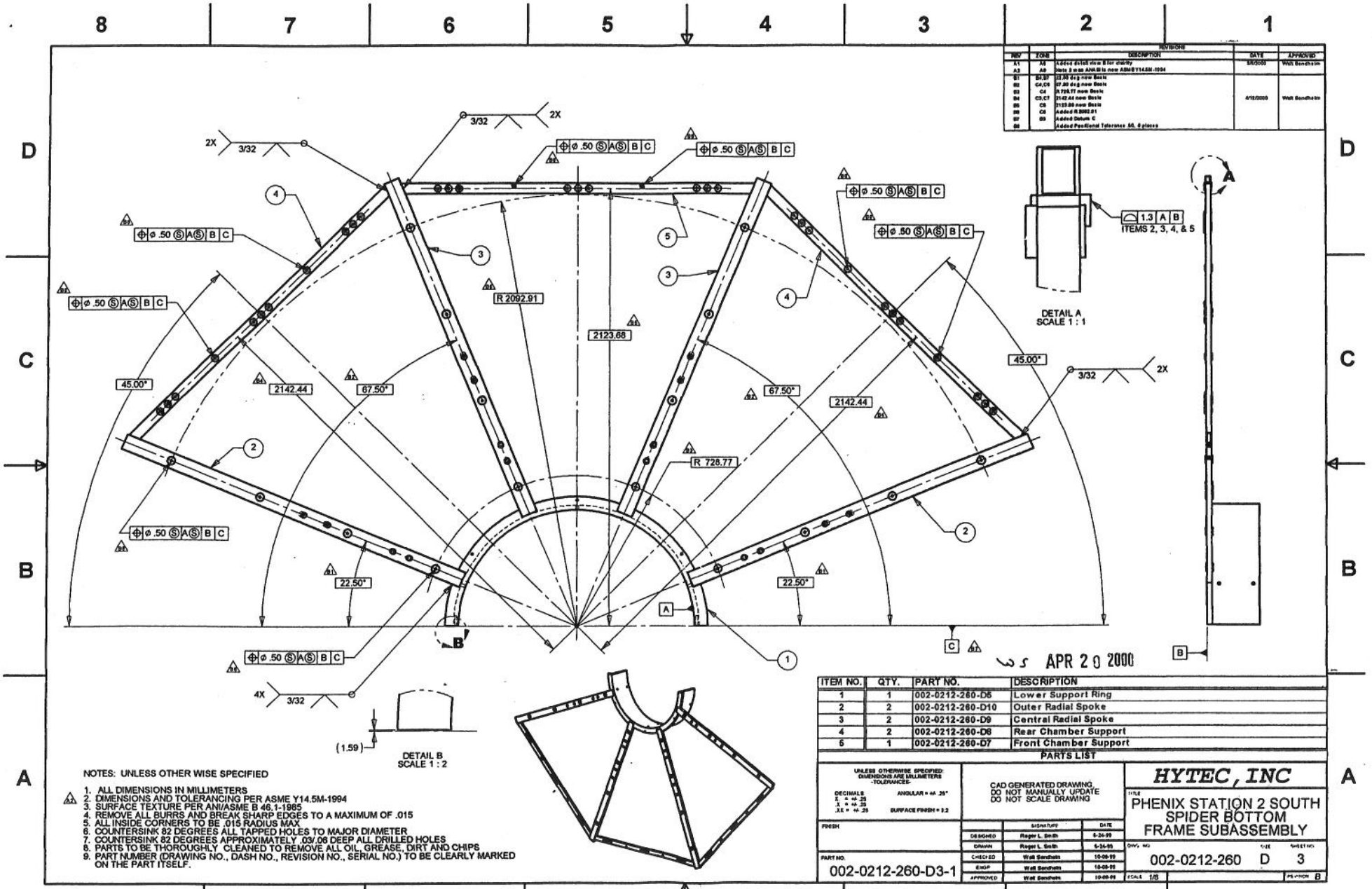
MATERIAL: 304 STAINLESS STEEL

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ASME Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

WS APR 20 2000

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS -TOLERANCES- DECIMALS .X = ±0.25 .X = ±0.25 .XX = ±0.25 ANGULAR = ±0.25° SURFACE FINISH = 3.2	CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING		HYTEC, INC
FINISH		SIGNATURE / DATE	TITLE: PHENIX STATION 2 SOUTH SPIDER UPPER SUPPORT RING
	DESIGNED	Roger L. Smith 6-24-99	
	DRAWN	Roger L. Smith 6-24-99	
PART NO. 002-0212-260-D4-1	CHECKED	Walt Sandholm 10-06-99	DWG NO. 002-0212-260 REV D SHEET NO. 4
	ENGR	Walt Sandholm 10-06-99	
	APPROVED	Walt Sandholm 10-06-99	SCALE 1/4 SIZE C



REV	ZONE	DESCRIPTION	DATE	APPROVED
A1	A8	Added detail view B for clarity	5/5/2000	Walt Sandheim
A2	A8	Note 2 was ANSI B is now ASME Y14.5M -1994		
B1	B4,B7	22.50 deg new Basis		
B2	C4,C6	67.50 deg new Basis		
B3	C4	R 728.77 new Basis		
B4	C5,C7	2142.44 new Basis	4/12/2000	Walt Sandheim
B5	C6	2123.68 new Basis		
B6	C4	Added R 2092.91		
B7	B5	Added Datum C		
B8		Added Positional Tolerance Ø.5 Ⓜ, 6 places		

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	002-0212-260-D5	Lower Support Ring
2	2	002-0212-260-D10	Outer Radial Spoke
3	2	002-0212-260-D9	Central Radial Spoke
4	2	002-0212-260-D8	Rear Chamber Support
5	1	002-0212-260-D7	Front Chamber Support

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ASME Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS .X ± ±0.25 .XX ± ±0.25 .XXX ± ±0.25 ANGULAR ± ±0.25° SURFACE FINISH 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	5-24-99
DRAWN	Roger L. Smith	5-24-99
CHECKED	Walt Sandheim	10-08-99
ENGR	Walt Sandheim	10-08-99
APPROVED	Walt Sandheim	10-08-99

PART NO. 002-0212-260-D3-1

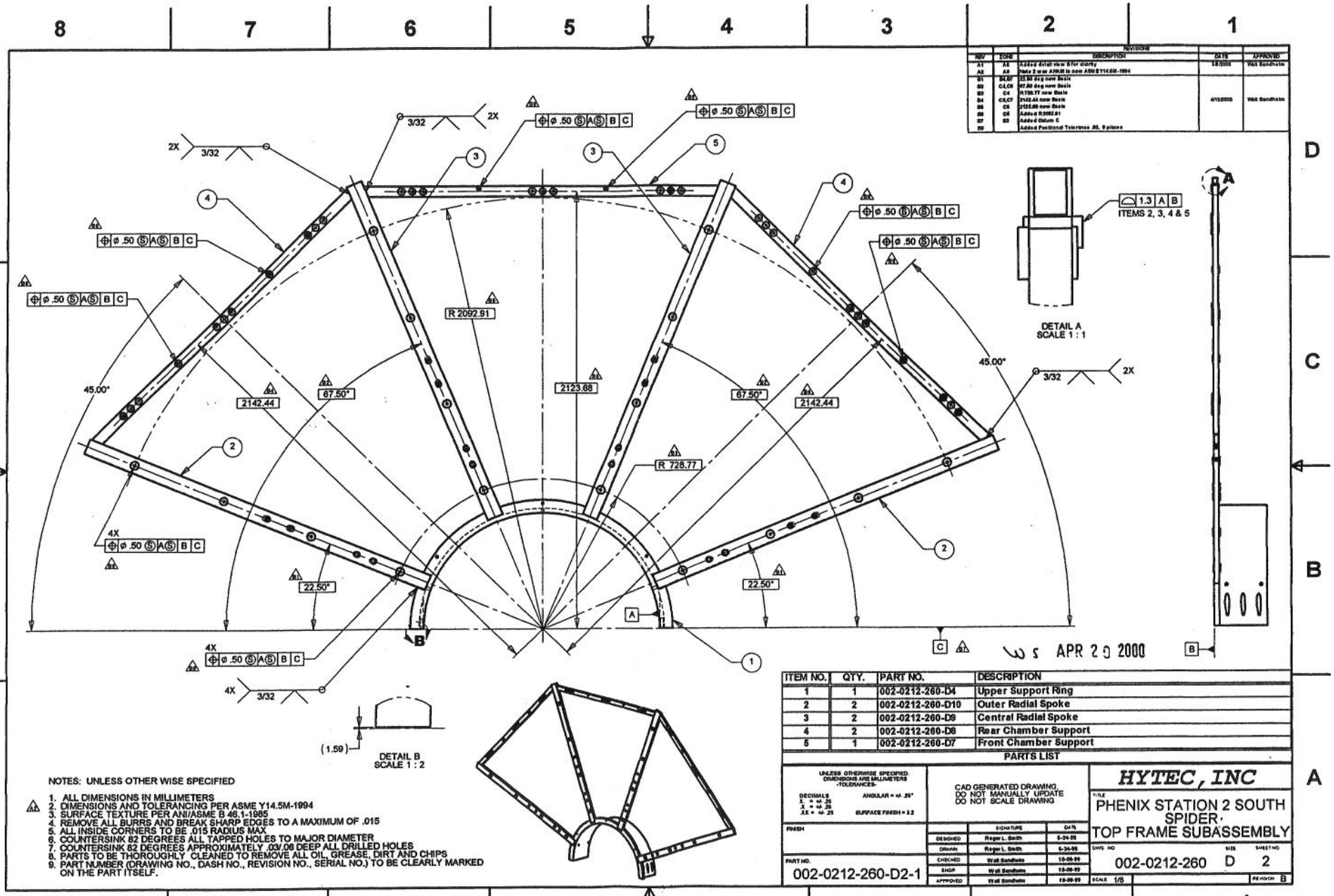
HYTEC, INC

TITLE: PHENIX STATION 2 SOUTH SPIDER BOTTOM FRAME SUBASSEMBLY

DWG. NO. 002-0212-260 SIZE D SHEET NO. 3

SCALE 1/8 REVISION B

APR 20 2000



REV	ZONE	DESCRIPTION	DATE	APPROVED
A1	A6	Added detail view B for clarity	3/7/2000	Walt Sandheim
A2	A6	Note 2 is per ANSI is now ASM EY14.5M-1994		
B1	B4,B7	22.50 deg now Basic		
B2	C4,C6	67.50 deg now Basic		
B3	C4	R 728.77 now Basic		
B4	C3,C7	2142.44 now Basic	4/13/2000	Walt Sandheim
B5	C5	2123.68 now Basic		
B6	C6	Added R 2092.91		
B7	B3	Added Datum C		
B8		Added Positional Tolerance .03, 8 places		

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	002-0212-260-D4	Upper Support Ring
2	2	002-0212-260-D10	Outer Radial Spoke
3	2	002-0212-260-D9	Central Radial Spoke
4	2	002-0212-260-D8	Rear Chamber Support
5	1	002-0212-260-D7	Front Chamber Support

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ASME Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS X = ±0.25, .X = ±0.25, .XX = ±0.25 ANGULAR = ±0.25° SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212-260-D2-1

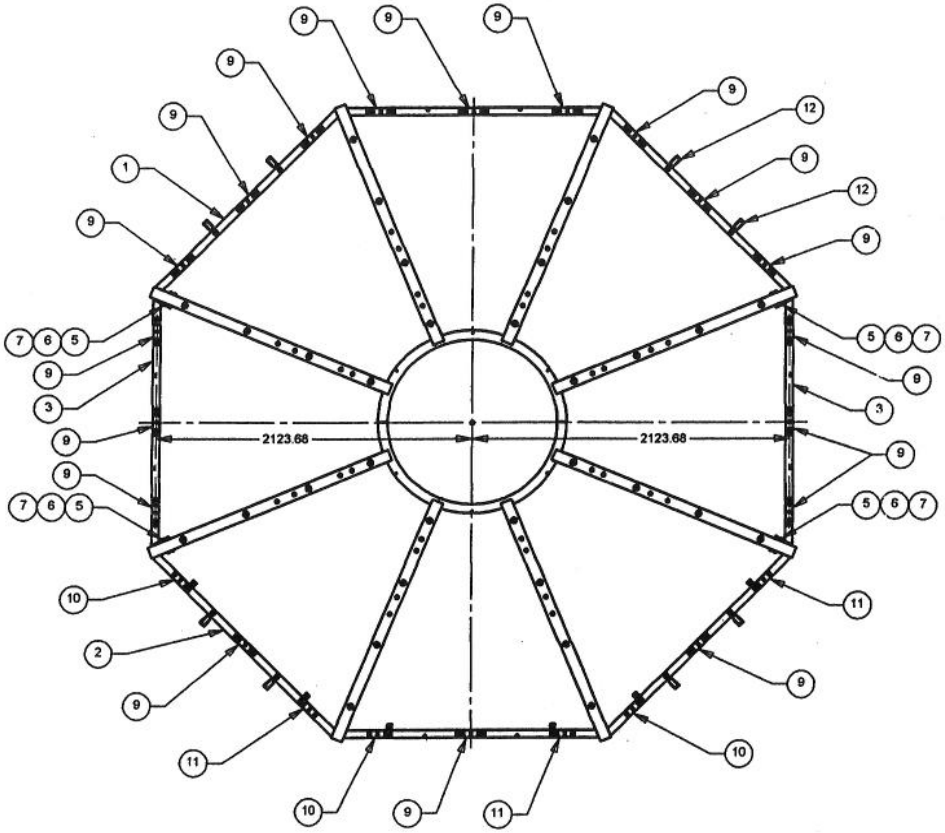
	SIGNATURE	DATE
DESIGNED	Roger L. Smith	5-24-99
DRAWN	Roger L. Smith	5-24-99
CHECKED	Walt Sandheim	10-06-99
ENGR	Walt Sandheim	10-06-99
APPROVED	Walt Sandheim	10-06-99

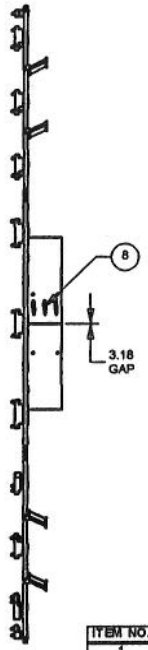
HYTEC, INC

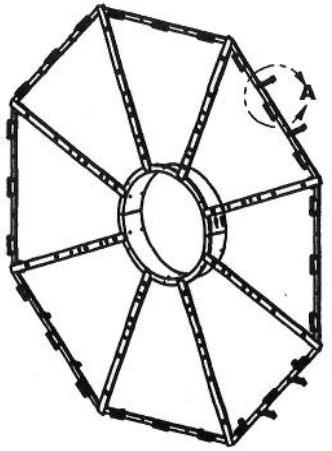
TITLE: PHENIX STATION 2 SOUTH SPIDER - TOP FRAME SUBASSEMBLY

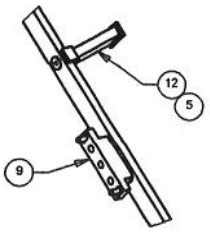
DWG NO: 002-0212-260 SIZE: D SHEET NO: 2

SCALE: 1/8 REVISION: B









DETAIL A
SCALE 1 : 6

REV	DESCRIPTION	DATE	APPROVED

ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL
1	1	002-0212-260-D2	Top Frame Sub-Assembly	
2	1	002-0212-260-D3	Bottom Frame Sub-Assembly	
3	2	002-0212-260-D6	Splice Tube Weldment	
4	8		Soc Hd Screw, 3/8-16 UNC-2A X 1.25 lg.	SST
5	14		Soc Hd Screw, 3/8-16 UNC-2A X 3.75 lg.	SST
6	16		Flat Washer, 3/8	SST
7	8		Hex Nut, 3/16 UNC-2B	SST
8	8	002-0212-261-D1	Inner Detector Stabilizer	
9	18	002-0212-262-D1	Support Bracket Assembly	
10	3	002-0212-264-D1	Right Support Bracket Assembly	
11	3	002-0212-263-D1	Left Support Bracket Assembly	

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANIVASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

OCT 13 1999

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETERS -TOLERANCES-
DECIMALS X. ± .25 X.X ± .25 X.XX ± .25 ANGULAR ± .25° SURFACE FINISH ± 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212260-D1-1

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	6-24-99
DRAWN	Roger L. Smith	6-24-99
CHECKED	Wall Sandheim	10-08-99
ENGR	Wall Sandheim	10-08-99
APPROVED	Wall Sandheim	10-08-99

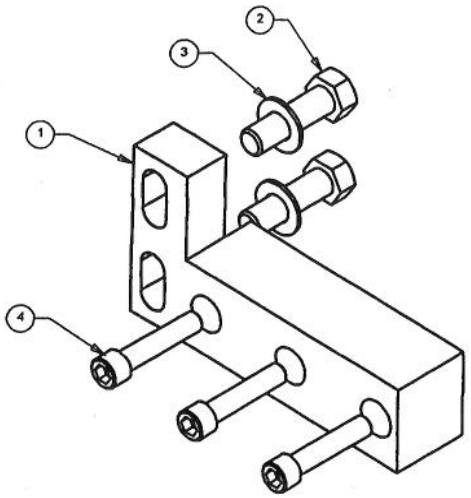
HYTEC, INC

PHENIX STATION 2 SOUTH SPIDER SUPPORT RING ASSEMBLY

002-0212-260 D 1

SCALE 1/16

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

W.S. OCT 13 1999

ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL
1	1	002-0212-264-D2	Right Support Block	
2	1		Hex Hd Screw, 1/2-13 UNC-2A X 1.75 lg.	SST
3	1		Flat Washer, 1/2	SST
4	4		Soc Hd Screw, 3/8-16 UNC-2A X 1.75 lg.	SST

PARTS LIST

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE MILLIMETERS -TOLERANCES- DECIMALS X = +/- .25, .X = +/- .25, .XX = +/- .25, ANGULAR = +/- .25°, SURFACE FINISH = 3.2

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE DO NOT SCALE DRAWING

FINISH

PART NO. 002-0212-264-D1-1

	SIGNATURE	DATE
DESIGNED	Roger L. Smith	7-14-99
DRAWN	Roger L. Smith	7-14-99
CHECKED	Walt Sandheis	10-06-99
ENGR	Walt Sandheis	10-06-99
APPROVED	Walt Sandheis	10-06-99

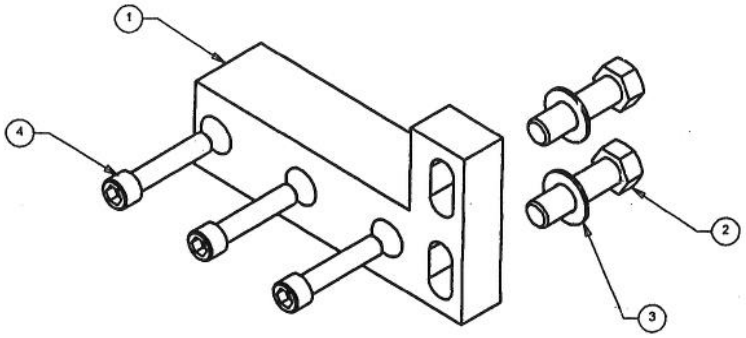
HYTEC, INC

TITLE: PHENIX STATION 2 SOUTH SPIDER SUPPORT RIGHT BRACKET ASSY

DWG. NO. 002-0212-264 SIZE D SHEET 1

SCALE 1/1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL
1	1	002-0212-263-D2	Left Support Block	
2	1		Hex Hd Screw, 1/2-13 UNC-2A X 1.75 lg.	SST
3	1		Flat Washer, 1/2	SST
4	4		Soc Hd Screw, 3/8-16 UNC-2A X 1.75 lg.	SST

PARTS LIST

NOTES: UNLESS OTHER WISE SPECIFIED

1. ALL DIMENSIONS IN MILLIMETERS
2. DIMENSIONS AND TOLERANCING PER ANASI Y14.5M-1994
3. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
4. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAXIMUM OF .015
5. ALL INSIDE CORNERS TO BE .015 RADIUS MAX
6. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
7. COUNTERSINK 82 DEGREES APPROXIMATELY .03/.06 DEEP ALL DRILLED HOLES
8. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREASE, DIRT AND CHIPS
9. PART NUMBER (DRAWING NO., DASH NO., REVISION NO., SERIAL NO.) TO BE CLEARLY MARKED ON THE PART ITSELF.

W.S. OCT 13 1999

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETERS -TOLERANCES-
DECIMALS X = +/- .25, .X = +/- .25, .XX = +/- .25
ANGULAR = +/- .25°
SURFACE FINISH = 3.2

CAD GENERATED DRAWING.
DO NOT MANUALLY UPDATE
DO NOT SCALE DRAWING

FINISH

	NAME	DATE
DESIGNED	Roger L. Smith	7-14-99
DRAWN	Roger L. Smith	7-14-99
CHECKED	Walt Sondheim	10-06-99
ENGR	Walt Sondheim	10-06-99
APPROVED	Walt Sondheim	10-06-99

PART NO. 002-0212-263-D1-1

HYTEC, INC

PHENIX STATION 2 SOUTH
SPIDER SUPPORT
LEFT BRACKET ASSY

SIZE: D | DWG NO: 002-0212-263 | REV: 1

SCALE: 1/1 | SHEET

PHENIX MuTr STATION 2 NORTH SPIDER INSTALLATION PROCEDURE

procedure name

PHENIX Procedure No. PP-2.5.5.4-19

Revision: A **Date: 4-22-02**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approvals

4/22/02
PHENIX S E & I Date

4/22/02
Cognizant Scientist/Engineer Date
/Activity Manager

4/22/02
PHENIX Safety Date

CA-D LIAISON Date

INTERNAL PROCEDURE

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	04/22/2002	n/a	P. Kroon, D. Lee, W. Lenz	n/a
RETIRED	Installation Complete	3/21/2007	n/a	D. Lynch, P. Giannotti, R. Pisani for PHENIX	D. Lynch

Station 2 North Spider Installation Procedure

1.0 Purpose and Scope

1.1 The purpose of this procedure is to provide direction for the rigging of the station 2 North support "spider". This structure locates all eight station 2 detectors in the North muon magnet. This procedure will provide detailed instructions for the safe installation of the support "spider" onto its mounting location off the back of the "teacup" and flanges on the bottom three lampshade panels.
Note that the weight for each half of the "spider" is 350 pounds.

2.0 Responsibilities

2.1 All operations shall be performed under the direction of the PHENIX experimental hall "person-in-charge", or their designee.

2.2 Due to the delicacy of this structure, and the critical alignment of its assembly in the magnet, this procedure and all relevant BNL safety guidelines must be strictly adhered to. In accordance with BNL policy, any individual may cease operations if they in any way feel unsafe or if they believe unsafe procedures are being followed, such a complaint shall be reviewed by the cognizant engineer, and if necessary, BNL ES&H service.

3.0 Prerequisites

3.1 Training: All personnel involved in this procedure shall have reviewed this procedure, and be fully knowledgeable about the way in which the support "spider" is assembled in the North magnet. A meeting will take place with all participants involved with this installation to review all aspects and answer any questions that any of the personnel may have.

3.2 All personnel involved with in this procedure shall have current BNL safety training requirements met to work in the PHEINX assembly hall, as part of Bldg.1008. The crane operator must have a current BNL crane operation safety training.

3.3 All personnel involved in this procedure shall wear hardhats and safety shoes.

4.0 Precautions

4.1 The area where rigging operations will be performed shall be cordoned-off to all personnel except the "person in charge" and the technicians assigned to perform this procedure.

4.2 Some operations will require personnel to work in close proximity to suspended loads. Do not permit anyone to be positioned under the load.

4.3 Lift half spiders by the swivel eyes attached to the hub, or approved slings attached to the spider framing as required.

5.0 Equipment List

5.1 Appropriate slings for lifting 1000 pounds and shackles

5.2 Two-3/8 lifting swivel eyes (supplied by Kenny Jones) – Jergens part # 23408 rated for 1000 lbs. each.

5.3 Guide ropes.

6.0 Preparation

6.1 Mount 6 aluminum support brackets to top half of spider using 3/8-16 x 1-1/2 inch stainless steel hex head screw, (provided by Kenny Jones). Drawing number 126Y-267806, D2. On the lower half spider attach 6 aluminum brackets as called out on drawing 126Y-267806, D3. On the two splice tube weldments attach 4 aluminum brackets as indicated on drawing 126Y-267806, D6. The drawing of the overall assembly of the support spider is 126Y-267806, D1.

6.2 For each half spider install 3 3/8-16 x 2 inch long set screws where indicated on the hub on drawing 126Y-267806, D4-5.

7.0 Procedure

7.1 Bottom half spider.

7.1.1 The hub flange faces the upstream side of the notch in the piston or in the direction of station 1. Approximate weight 300 pounds.

7.1.2 After lowering the bottom half on to the wooden platform in the bottom of magnet, attach two slings to the junction of the outer radial spokes with the hub. See drawing 126Y-267806, D3. The slings will need to be long enough to go on either side of the magnet piston.

7.1.3 Move spoke portion of the half spider towards the magnet back plate with the hub facing the piston.

7.1.4 The six aluminum mounting blocks should be attached to the half spider using the 3/8-16 x 1.5 inch, hex head, stainless, and bolts. These bolts should not be completely tight. A ½-13 x 1.5 inch, socket head, stainless bolt is placed through the outer support bar and the aluminum block. This will be the fastener that mounts the half spider to the bottom three lampshade panels.

7.1.5 Lift the lower half of the spider into position in the piston notch, attach using the ½-13 socket head bolts, do not completely tighten until the top half of the spider and the splice tubes are attached.

7.2 Top half spider

7.2.1 The hub flange faces the upstream side of the piston notch, or station 1 side. See drawings 126Y-267806, sheets D1,2,3.

7.2.2 Attach two slings, of the proper load rating, to the junction of the outer support bars and central radial spoke (# 3 and 4 on drawing 126Y-267806, D2).

7.2.3 Attach guide ropes to the outer radial spokes to help position. Have all six aluminum mounting blocks attached to the outer support bars. Do not completely tighten.

7.2.4 Lift and lower the top half spider into place and attach to the teacup at the outside boundary. Attach upper half of spider to teacup flange using 6 ½-13 x 1.5 inch long socket head screws. These are installed through the outer support bar – through the aluminum support brackets, into the teacup flange. Do not fully tighten until spider is fully assembled.

7.3 Splice tube weldments

7.3.1 Attach the two splice tube weldment assemblies as shown in the overall spider assembly drawing 126Y-267806, D1. The weldment tubes are shown on 126Y-267806, D6. These tubes bolt to the two spider halves; each uses 4 bolts with washers and nuts.

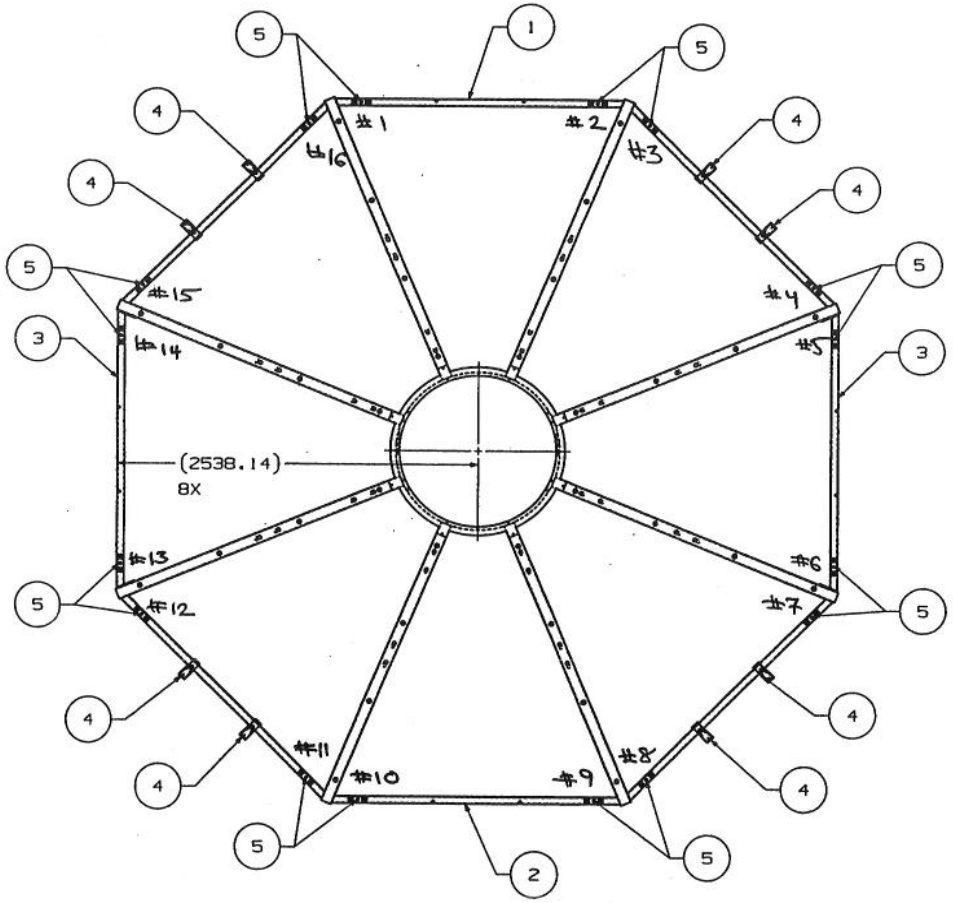
7.3.2 Prior to alignment, it is possible to use the 6 – 3/6-16 x 3 inch long screws that pass through the spider hub, to help fine position the spider assembly to the teacup. Tighten all bolts.

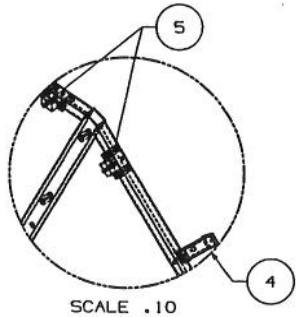
8.0 Alignment

8.1 Survey the spider assembly.

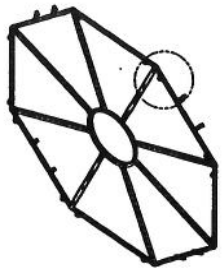
8.1.1 There are 32 paste on targets around the outer support bars and weldment bars, two per aluminum mounting block. They are placed on the stainless inserts that have been machined parallel to the tube. The surfaces of these inserts will set the plane for the spider. There are a couple of paste on targets close to the spider hub. The aluminum spider mounting blocks have been machined to give a designed surface of the back of the teacup at a PHENIX Z value of 3,400 mm from the IP. The plane for the outer 32 targets should be within a plane that is better then 1mm in Z.

LOOKING (PHENIX) NORTH, SPIDER SUPPORT BLOCK #'s





SCALE .10



SCALE .025

NOV 09 2001

ALL DIMENSIONS IN MILLIMETERS

PARTS LIST

ITEM NO.	QTY	DWG. NO.	DESCRIPTION
1	1	002-0212-360-02	TOP FRAME SUB-ASSEMBLY
2	1	002-0212-360-03	BOTTOM FRAME SUB-ASSEMBLY
3	2	002-0212-360-06	SPLICE TUBE WELDMENT
4	8	002-0212-360-010	REAR OCTANT STABILIZER
5	16	002-0212-360-011	SUPPORT BRACKET

REVISIONS						
A		INITIAL RELEASE	10/01			WALT
		ORIGINAL ISSUE				

NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
4. ALL INSIDE CORNERS TO BE .4 RADIUS MAX.
5. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
6. COUNTERSINK 82 DEGREES APPROXIMATELY .8 DEEP ALL DRILLED HOLES
7. PARTS TO BE THOROUGHHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

	SIGNATURE	DATE	GROUP
DESIGNED	WALT	10/01	P-25
DRAWN			
CHECKED			
FULL CHK.			
APPROVED			
RELEASED			

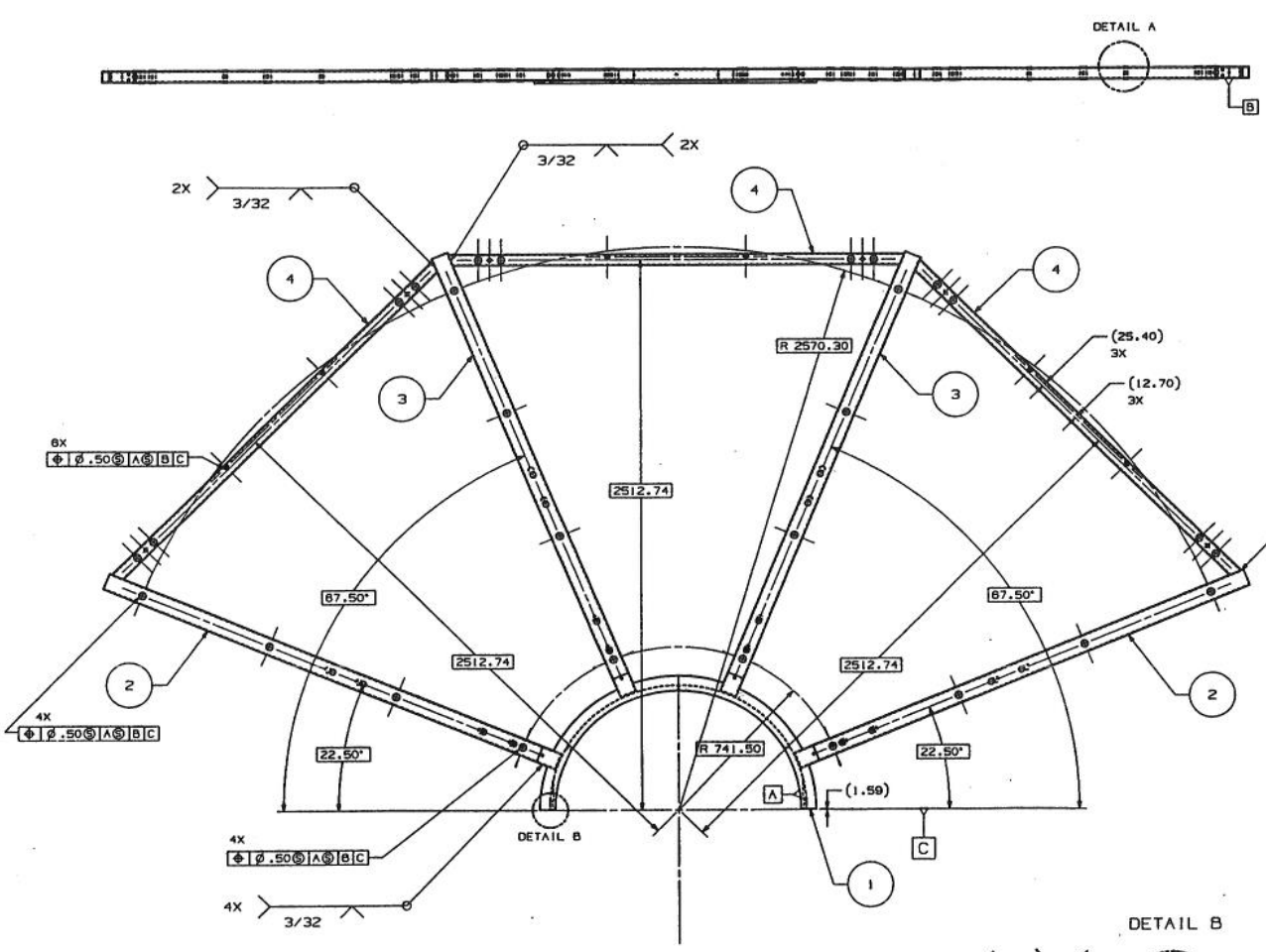
DRAWN UNC
TITLE CHECK UNC

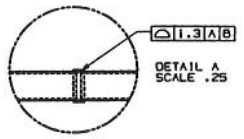
TITLE
STATION 2 NORTH
SPIDER SUPPORT
RING ASSEMBLY

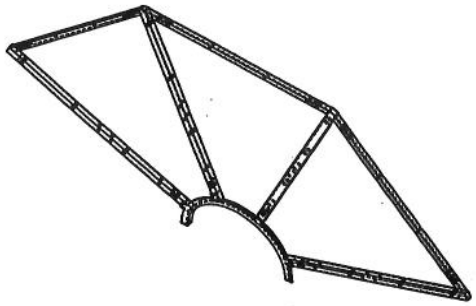
PHENIX DRAWING NO. 002-0212-260-01

TOLERANCE-UNLESS OTHERWISE NOTED:
XX± .25 ANGULAR ± .25°
0.XX± 0.XXX± FINISH 3.2

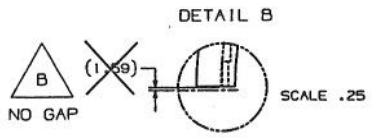
SCALE	SIZE	DRAWING NO.	REV
1/16	D	126Y-267806	1







SCALE .05



US DEC 07 2001

ALL DIMENSIONS IN MILLIMETERS

PARTS LIST

ITEM NO.	QTY.	DWG. NO.	DESCRIPTION
1	1	002-0212-360-D4	UPPER SUPPORT RING
2	2	002-0212-360-D7	OUTER RADIAL SPOKE
3	2	002-0212-360-D8	CENTRAL RADIAL SPKE
4	3	002-0212-360-D9	OUTER SUPPORT BARS

B		1/16" GAP REMOVED	12/01	WALT		WALT
A		INITIAL RELEASE	10/01			WALT
		ORIGINAL ISSUE				

NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
4. ALL INSIDE CORNERS TO BE .4 RADIUS MAX.
5. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
6. COUNTERSINK 82 DEGREES APPROXIMATELY .8 DEEP ALL DRILLED HOLES
7. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

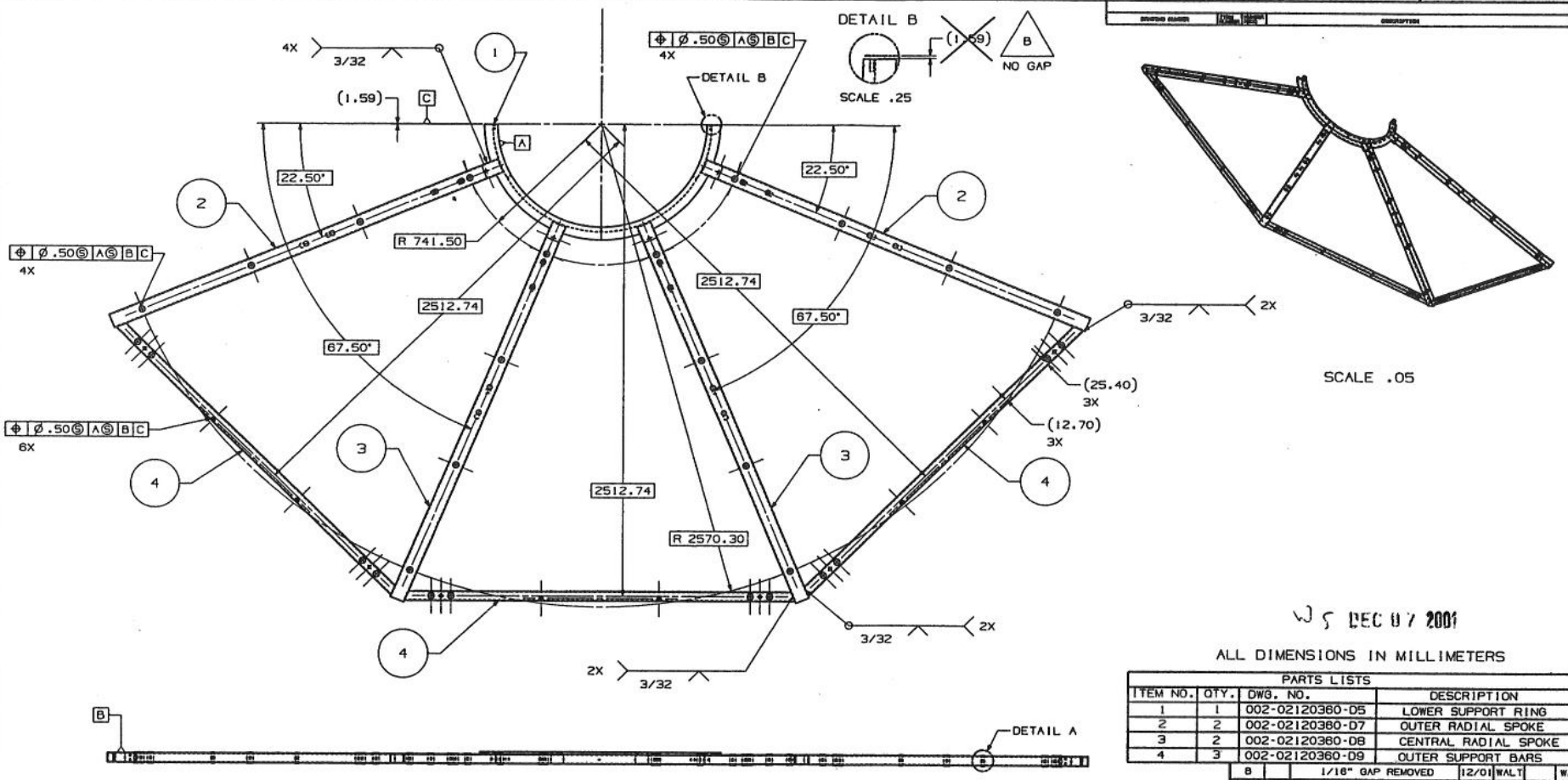
	SIGNATURE	DATE	GROUP
DRAWN	WALT	10/01	P-25
CHECKED			
APPROVED			

STATION 2 NORTH
SUPPORT SPIDER
UPPER ASSEMBLY

PHENIX DRAWING NO. 002-0212-360-D2

SCALE 1/10

126Y-267806 D 2



WJ S DEC 07 2001

ALL DIMENSIONS IN MILLIMETERS

PARTS LISTS

ITEM NO.	QTY.	DWG. NO.	DESCRIPTION
1	1	002-02120360-D5	LOWER SUPPORT RING
2	2	002-02120360-D7	OUTER RADIAL SPOKE
3	2	002-02120360-D8	CENTRAL RADIAL SPOKE
4	3	002-02120360-D9	OUTER SUPPORT BARS

B		1/16" GAP REMOVED	12/01	WALT	WALT
A		INITIAL RELEASE	10/01		WALT
		ORIGINAL ISSUE			

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

	SIGNATURE	DATE	GROUP
DRAWN	WALT	10/01	P-25
CHKD			
ENGR			
PROJ ENGR			
APPROVED			
RELEASED			

TITLE: STATION 2 NORTH SUPPORT SPIDER LOWER ASSEMBLY

PHENIX DRAWING NO. 002-0212-360 D3

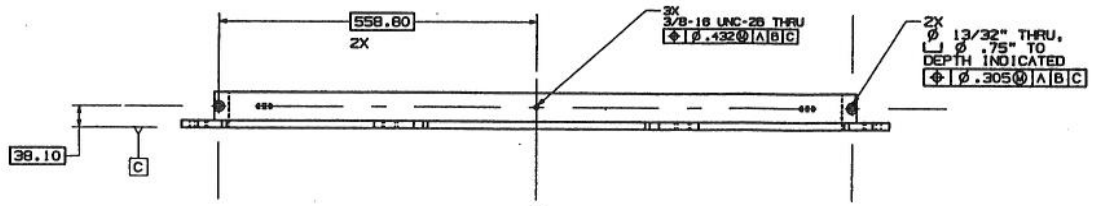
TOLERANCE UNLESS OTHERWISE NOTED: XXX ±.25 ANGULAR ±.25

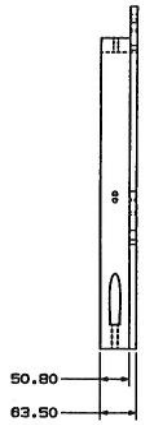
SCALE 1/10 | SIZE D | 126Y-267806 D 3

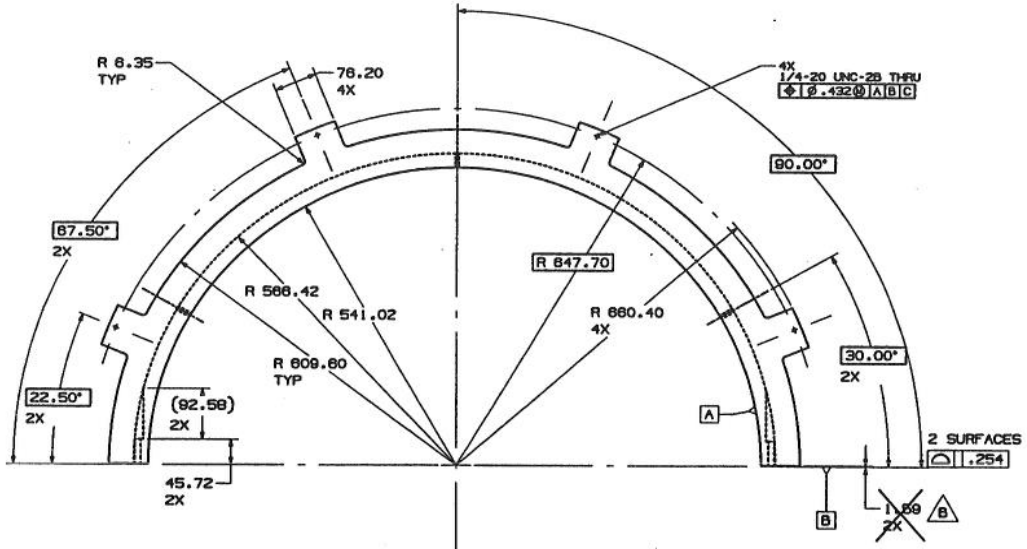
NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
4. ALL INSIDE CORNERS TO BE .4 RADIUS MAX.
5. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
6. COUNTERSINK 82 DEGREES APPROXIMATELY .8 DEEP ALL DRILLED HOLES
7. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS

DETAIL A
SCALE .25







NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
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WS DEC 07 2001

ALL DIMENSIONS IN MILLIMETERS

B		MACHINE WITH OUT GAP	11/01	WALT		WALT
A		INITIAL RELEASE	11/01			WALT
		ORIGINAL ISSUE				
REVISION LETTER	ALPHA AUTH	REVISIONS	DATE	Originator ID	Originator ID	Approved ID

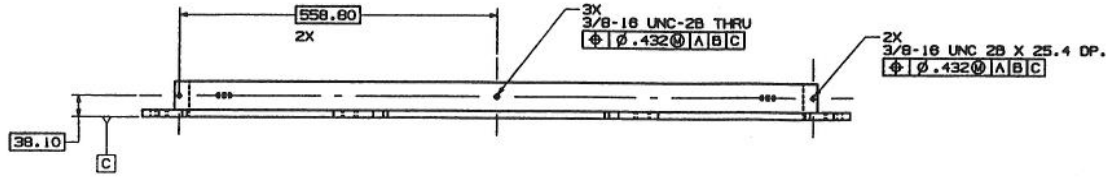
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

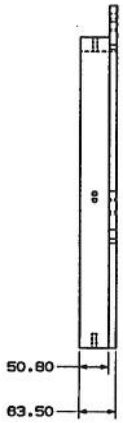
CLASSIFICATION BY: UNC
PARTS: UNC
TITLE BLOCK: UNC

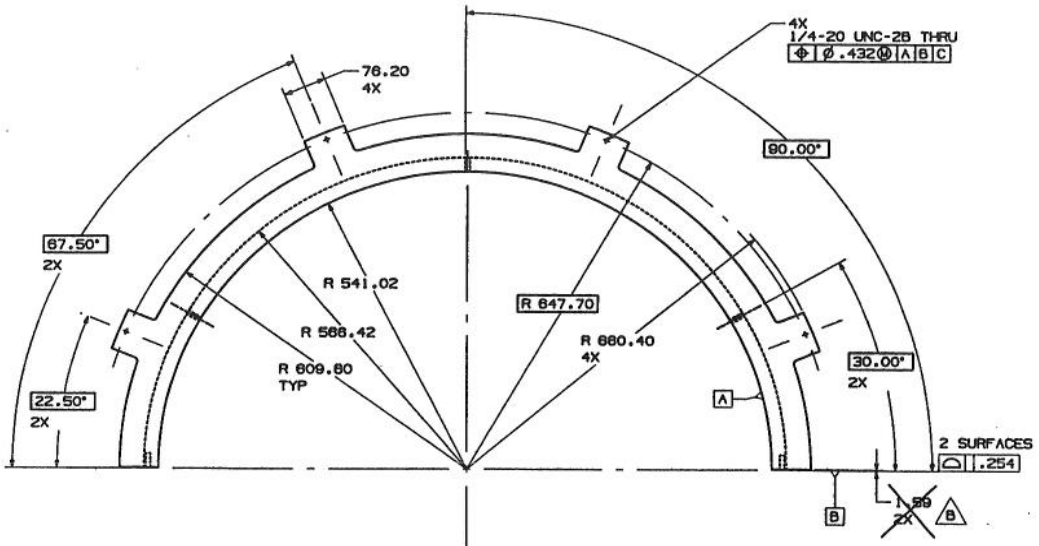
TITLE
STATION 2 NORTH
SUPPORT SPIDER
UPPER SUPPORT RING

	SIGNATURE	DATE	GROUP
ORIGINATED	WALT	11/01	P-25
DRAWN			
CHECKED			
PROJ. ENG.			
APPROVED			
RELEASED			

PHENIX DRAWING NO. 002-0212-360-D4
TOLERANCE - UNLESS OTHERWISE NOTED
X = ± .25 ANGULAR ± .25
FINISH 3.2
SCALE .25
DRAWING NO. 126Y-267806
SHEET NO. 4
SIZE D







NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
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7. PARTS TO BE THOROUGHHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS

WS DEC 07 2001

ALL DIMENSIONS IN MILLIMETERS

B		MACHINE WITH OUT GAP	11/01	WALT		WALT
A		INITIAL RELEASE	11/01			WALT
		ORIGINAL ISSUE				
REVISION LETTER	REVISION NOTICE	REVISIONS	DATE	Designed BY	Checked BY	Approved BY

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

CLASSIFICATION OF: DIVISION: UNC
PARTS: UNC TITLE CLASS: UNC

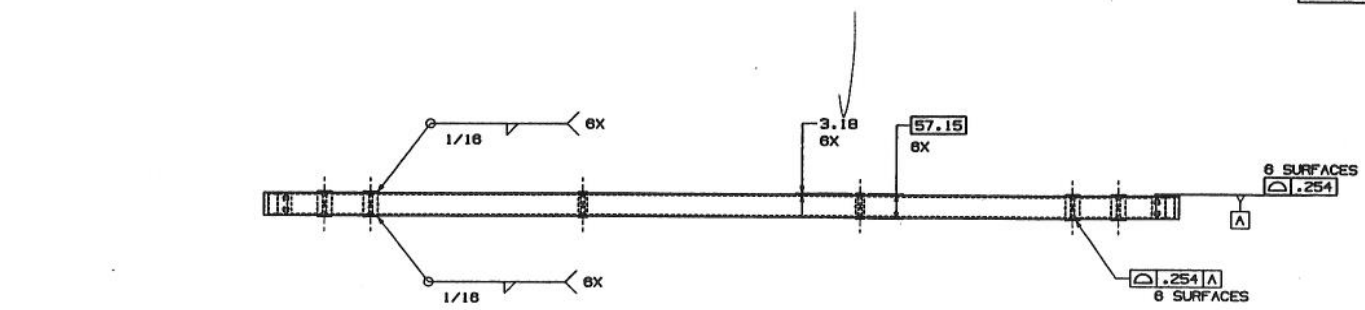
TITLE
STATION 2 NORTH
SUPPORT SPIDER
LOWER SUPPORT RING

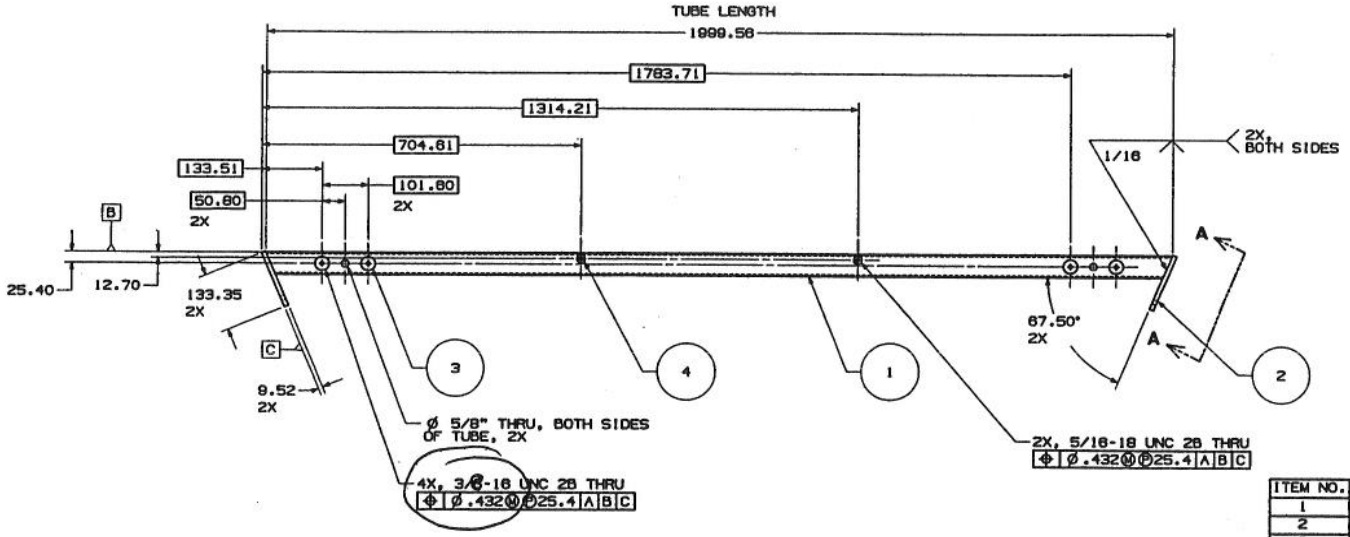
	SIGNATURE	DATE	GROUP
ORIGINATED	WALT	11/01	P-25
DRAWN			
DESIGNED			
PROJ. ENGR.			
APPROVED			
RELEASED			

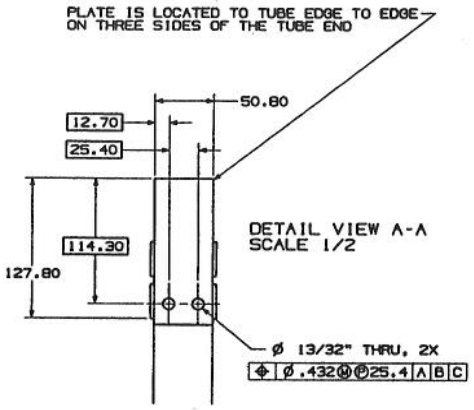
PHENIX DRAWING NO. 002-0212-380-05

TOLERANCE - UNLESS OTHERWISE NOTED:
XX± ____ 0.XX ± .25 ANGULAR ± .25
X ± ____ 0.X ± ____ FINISH 3.2

SCALE .25 | SIZE D | DRAWING NO. 126Y-267806 | SHEET 5 OF 5







WS NOV 29 2001

ALL DIMENSIONS IN MILLIMETERS

ITEM NO.	QTY.	DESCRIPTION	MATERIAL
1	2	RECT. TUBING 2" X 2" X .120" WALL	SST-304
2	2	END MOUNTING PLATE, SEE SHEET 86A	SST-304
3	4	ROUND PLUG 1.25" DIA.	SST-304
4	2	ROUND PLUG .75" DIA.	SST-304

NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
4. ALL INSIDE CORNERS TO BE .4 RADIUS MAX.
5. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
6. COUNTERSINK 82 DEGREES APPROXIMATELY .8 DEEP ALL DRILLED HOLES
7. PARTS TO BE THOROUGHHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS

REV		DESCRIPTION	DATE			
A		INITIAL RELEASE	11/01			WALT
		ORIGINAL ISSUE				

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

	SIGNATURE	DATE	GROUP
DESIGNED	WALT	11/01	
DRAWN			
CHECKED			
ENGR APPR.			
APPROVED			
RELEASED			

CLASSIFICATION # — DIVISION: UNC
PROJ: UNC — TITLE CLASS: UNC

TITLE
STATION 2 NORTH
SUPPORT SPIDER
SPLICE TUBE WELDMENT

PHENIX DRAWING NO. 002-0212-808-06

TOLERANCE- UNLESS OTHERWISE NOTED
X= ____ .XX= ±.25 ANGULAR= ±.25
.XXX= ____ FINISH= 125

SCALE .2 — DRAWING NO. 128Y-267806 — SHEET NO. D 6

ITEM NUMBER	NUMBER REQD	DESCRIPTION

DETAIL OF END MOUNT PLATE, FROM SHEET D6

NOTES: UNLESS OTHERWISW SPECIFIED

1, DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2, SURFACE TEXTURE PER ANI/ASME B 46.1-1985
3, REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
4, ALL INSIDE CORNERS TO BE .4 RADIUS MAX.
5, COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
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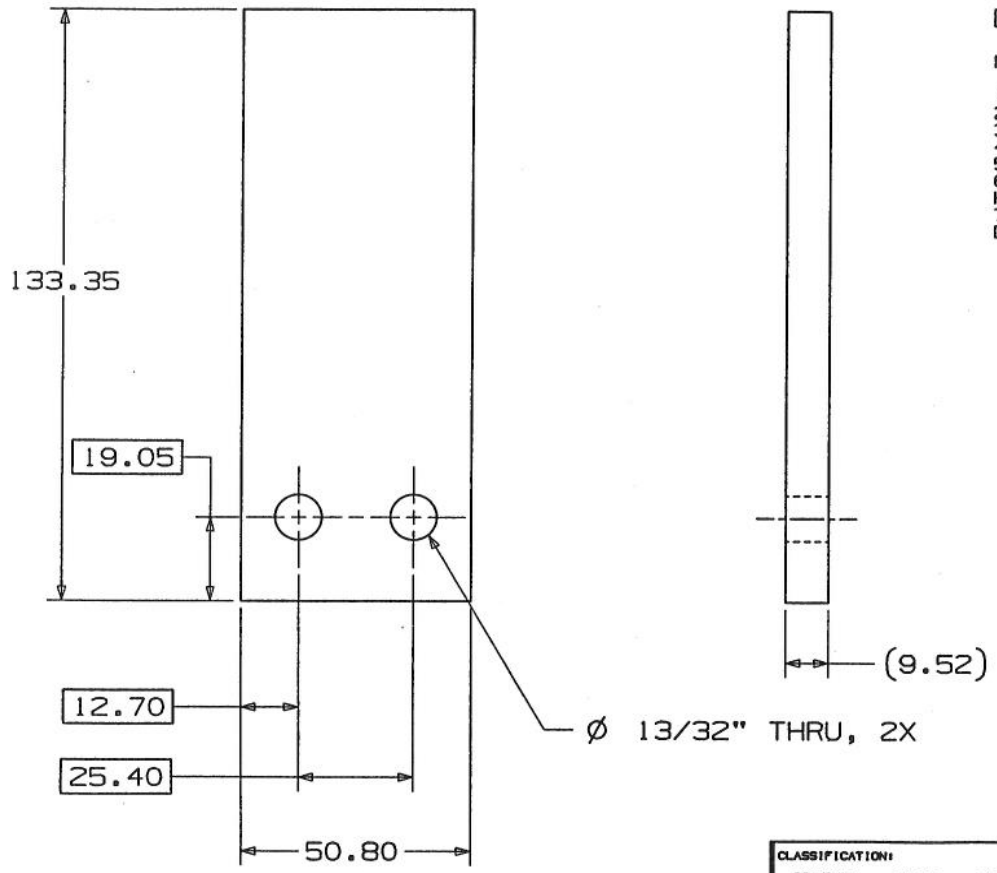
7, PARTS TO BE THOROUGHHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS



NOV 09 2001

ALL DIMENSIONS IN MILLIMETERS

MAT'L: SST 304, MAKE 2

REV	CLASS REVIEW	REVISIONS	DATE	CHANGED BY	CHECKED BY	APPROVED BY
		INITIAL RELEASE	11/01			WALT
A		ORIGINAL ISSUE				

CLASSIFICATION: DRAWING: PART: TITLE BLOCK:

	SIGNATURE	DATE	GROUP
ORIG	WALT	11/01	P-25
DRAWN			
CHECKED			
PROJ ENGR			
APPROVED			
RELEASED			

LOS ALAMOS
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO, 87545

TOLERANCE- (UNLESS OTHERWISE NOTED)
X=± 0.XX =± .25 ANG=± .25
.X=± 0.XXX=± FIN= 3.2

TITLE
STATION 2 NORTH
SUPPORT SPIDER
SPLICE TUBE END PLATE

PHENIX DRAWING NO. 002-0212-806-B6A

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	NO.
1:1		126Y-267806	B	6A

PHENIX

PHENIX MuTr STATION 2 NORTH INSTALLATION PROCEDURE

procedure name

PHENIX Procedure No. PP-2.5.5.4-20

Revision: A **Date: 4-22-02**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approvals

4/24/02
PHENIX S E & I Date

Cognizant Scientist/Engineer Date
/Activity Manager

4/24/02
PHENIX Safety Date

4/24/02
CA-D LIAISON Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	04/22/2002	n/a	P. Kroon, D. Lee, W. Lenz, C. Pearson	n/a
RETIRED	Installation Complete	3/21/2007	n/a	D. Lynch, P. Giannotti, R. Pisani for PHENIX	D. Lynch

Station 2 North Installation Procedure

1.0 Purpose and Scope

1.1 The purpose of this procedure is to provide direction for the rigging of the station 2 North octants. This procedure will provide detailed instructions for the safe installation of the octants onto its mounting location on the back of the "spider". Note that the weight for each octant is 325 lbs.

2.0 Responsibilities

2.1 All operations shall be performed under the direction of the PHENIX experimental hall "person-in-charge", or their designee.

2.2 Due to the delicacy of this structure, and the critical alignment of its assembly in the magnet, this procedure and all relevant BNL safety guidelines must be strictly adhered to. In accordance with BNL policy, any individual may cease operations if they in any way feel unsafe or if they believe unsafe procedures are being followed, such a complaint shall be reviewed by the cognizant engineer, and if necessary, BNL ES&H service.

3.0 Prerequisites

3.1 Training: All personnel involved in this procedure shall have reviewed this procedure, and be fully knowledgeable about the way in which the octant is mounted in the North magnet. A meeting will take place with all participants involved with this installation to review all aspects and answer any questions that any of the personnel may have. All personnel shall sign acknowledgement sheets to this affect.

3.2 All personnel involved with in this procedure shall have current BNL safety training requirements met to work in the PHENIX experimental hall, Bldg. 1008. The crane operator must have a current BNL crane operation safety training.

3.3 All personnel involved in this procedure shall wear hardhats and safety shoes.

4.0 Precautions

4.1 The area where rigging operations will be performed shall be cordoned-off to all personnel except the "person in charge" and the technicians assigned to perform this procedure.

4.2 Some operations will require personnel to work in close proximity to suspended loads. Do not permit anyone to be positioned under the load.

4.3 Lift the octants with the commercial lifting fixture only and only with the protective covers in place on the octant.

5.0 Equipment List

5.1 Appropriate ANVER lifting fixture.

5.2 "C" fixture, Dwg. No. 002-0212-610-1A.

5.3 Guide ropes.

5.4 Shackles

6.0 Preparation

6.1 Support "spider" in place.

6.2 Stainless threaded rods in place on the "spider" where the octant is to be placed. No other threaded rods in place on spider except where octant is already installed.

7.0 Procedure

7.1 Front octants.(smaller octants)

7.1.1 The frame side with the machined surface cutout faces downstream. Installation proceeds from the bottom of the spider to the top at every other location beginning at 6:00 o'clock and proceeding in order 6:00,3:00,9:00,12:00.

7.1.2 FIRST OCTANT ONLY _ 6:00 position

7.1.2.1 Attach "C" fixture to the crane hook and attach the ANVER lifting fixture to the "C" fixture.

7.1.3 Attach the ANVER lifting fixture to the octant in the horizontal position following the manufacturer's instructions and with the fixtures provided. Lift the octant and tilt the octant to a vertical position.

7.1.4 Rotate the octant to the orientation in the "spider".

7.1.5 Attach guide ropes to the octant.

7.1.6 First Octant Only

7.1.6.1 Lift and lower the octant in place downstream of the spider, to allow possible rotation of the octant to get into position under the piston. Once the octant is directly under the piston move upstream and attach to the "spider" at the outside boundary. Place temporary nuts and spacers on the side threaded rod, using guide ropes as needed to stabilize the octant

7.1.7 Remaining octants

7.1.7.1 No "C" fixture needed. Lift and lower the octant into place. Attach the spider to the outside assembly and place temporary nuts and spacers on the threaded rod on the sides.

7.1.8 Remove aluminum plates on the upstream side of the octants.

7.1.9 Install alignment lenses.

7.2 Rear Octants.

7.2.1 The frame side with the machined surface for the lens blocks faces downstream. Installation proceeds from the bottom of the spider to the top at every other location beginning at 4:30 o'clock and proceeding in order 4:30,7:30,1:30,10:30.

7.2.2 Attach the ANVER lifting fixture to the octant in the horizontal position following the manufacturers instructions. Lift the octant and tilt the octant to a vertical position.

7.2.3 Rotate the octant to the orientation in the "spider".

7.2.4 Attach guide ropes to the octant.

7.2.5 Remove temporary nuts on adjacent octants on the sides.

7.2.6 Attach 2 stabilizer brackets to the outside cross member on the spider, drawing number 002-0212-806 D10.

7.2.7 Remove protective aluminum cover on upstream side of octant.

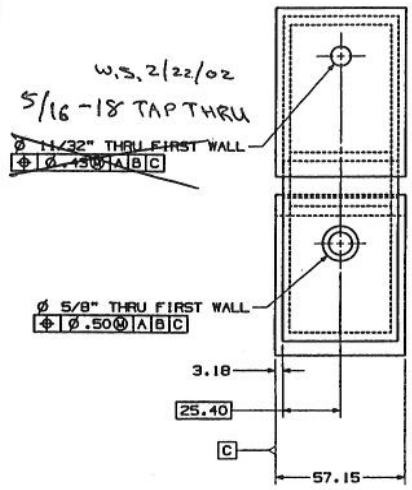
7.2.8 Lift and lower the octant into place and attach to the stabilizer brackets at the outside boundary. Place nuts and washers on the side threaded rods and torque to 20 ft-lbs. Use guide ropes as needed to stabilize the octant until nuts are secured.

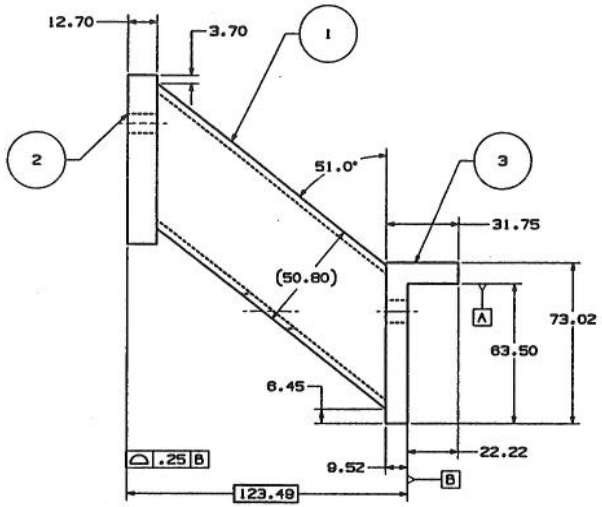
7.2.9 Install alignment lenses.

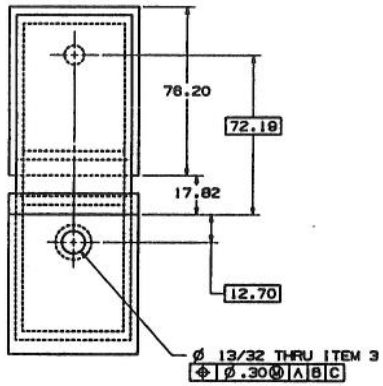
7.3 Remove downstream protective covers as the FEE system is installed.

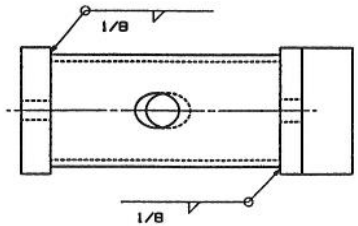
8.0 Alignment

8.1 Survey the octants and fine tune locations of the octants beginning at the bottom and working towards the top from the downstream side. Check all mounting nuts for torque of 20 ft-lb.









NOV 09 2001

ALL DIMENSIONS IN MILLIMETERS

ITEM NO.	QTY.	DESCRIPTION	MATERIAL
1	1	SQUARE TUBING 2" X 2" X .120 WALL	SST-304
2	1	PLATE	SST-304
3	1	ANGLE	SST-304

A		INITIAL RELEASE	11/01		WALT
		ORIGINAL ISSUE			

	SIGNATURE	DATE	GROUP
DESIGNED	WALT	11/01	P-25
DRAWN			
CHECKED			
PEER REV.			
APPROVED			
RELEASED			

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

DESIGNED BY UNC
DRAWN UNC
TITLE UNC

STATION 2 NORTH
SUPPORT SPIDER
REAR OCTANT STABILIZER

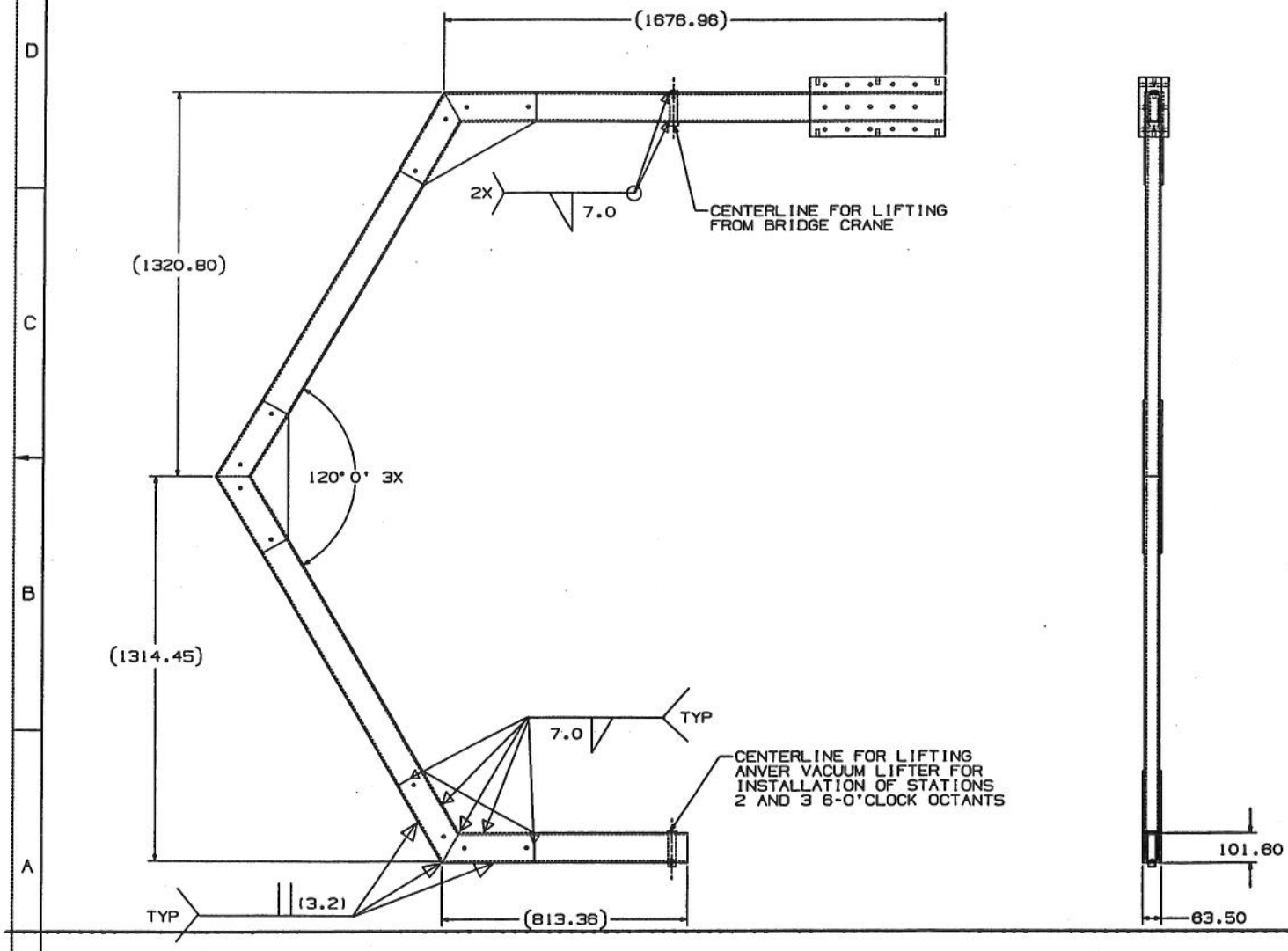
PHENIX DRAWING NO. 002-0212-808-010

TOLERANCE UNLESS OTHERWISE NOTED
XX± .25 ANGULAR ± .25
0.XX± 0.100 FINISH 3.2

SCALE 1:1
DRAWING NO. 126Y-267808
SHEET NO. D
REV. NO. 10

NOTES: UNLESS OTHERWISW SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANASI Y14.5M-1994
2. SURFACE TEXTURE PER ANI/ASME B 46.1-1995
3. REMOVE ALL BURRS AND BREAK SHARP EDGES TO A MAX. OF .4
4. ALL INSIDE CORNERS TO BE .4 RADIUS MAX.
5. COUNTERSINK 82 DEGREES ALL TAPPED HOLES TO MAJOR DIAMETER
6. COUNTERSINK 82 DEGREES APPROXIMATELY .8 DEEP ALL DRILLED HOLES
7. PARTS TO BE THOROUGHLY CLEANED TO REMOVE ALL OIL, GREESE, DIRT AND CHIPS



NOTES:
UNLESS OTHERWISE SPECIFIED

1. DRAWING GIVING WELD CALL OUTS FOR JUNCTIONS OF RECTANGULAR TUBING AND 1/2 INCH STEEL PLATES
2. NOTE ALL AROUND WELD ON OUTSIDE EDGES OF THE TWO 1.INCH DIAMETER STEEL PLUGS
3. WELDS PER ANSI/AWS D1.1
4. WELD SYMBOLS PER ANSI/AWS A2.4-93
5. BREAK SHARP EDGES, CHAM. OR R. 1 TO 2 MM.

ALL DIMENSIONS IN MILLIMETERS

A	INITIAL RELEASE	2/00		WALT
	ORIGINAL ISSUE			

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

	SIGNATURE	DATE	GROUP
DRAWN	WALT	2/00	P-25

LIFTING FIXTURE FOR STATIONS 2 & 3 6-O'CLOCK OCTANTS

PHENIX DRAWING NO. 002-0212-810-1A

TOLERANCE - UNLESS OTHERWISE NOTED:
XXX ± .25 ANGULAR ± .25

SCALE .15

126Y-267791 D 1A

PHENIX MuTr STATION 3 NORTH INSTALLATION PROCEDURE

procedure name

PHENIX Procedure No. PP-2.5.5.4-21

Revision: A **Date: 4-23-02**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approvals

4/30/02
PHENIX S E & I Date

14 May 02
Cognizant Scientist/Engineer Date
/Activity Manager

4/30/02
PHENIX Safety Date

5/14/2002
CA-D LIAISON Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	04/23/2002	n/a	P. Kroon, D. Lee, W. Lenz, C. Pearson	n/a
RETIRED	Installation Complete	3/21/2007	n/a	D. Lynch, P. Giannotti, R. Pisani for PHENIX	D. Lynch

Station 3 North Installation Procedure

1.0 Purpose and Scope

1.1 The purpose of this procedure is to provide direction for the rigging of the station 3 North octants. This procedure provides detailed instructions for the safe installation of the octants onto their mounting locations on the back plate of the north muon magnet. Note that the weight for each octant is 600 lbs.

2.0 Responsibilities

2.1 All operations shall be performed under the direction of the PHENIX experimental hall "person-in-charge", or their designee.

2.2 Due to the delicacy of this structure, and the critical alignment of its assembly in the magnet, this procedure and all relevant BNL safety guidelines must be strictly adhered to. In accordance with BNL policy, any individual may cease operations if they in any way feel unsafe or if they believe unsafe procedures are being followed, such a complaint shall be reviewed by the cognizant engineer, and if necessary, BNL ES&H service.

3.0 Prerequisites

3.1 Training: All personnel involved in this procedure shall have reviewed this procedure, and be fully knowledgeable about the way in which the octant is mounted in the North magnet. A meeting will take place with all participants involved with this installation to review all aspects and answer any questions that any of the personnel may have.

3.2 All personnel involved with in this procedure shall have current BNL safety training requirements met to work in the PHENIX experimental hall, Bldg. 1008. The crane operator must have a current BNL crane operation safety training.

3.3 All personnel involved in this procedure shall wear hardhats and safety shoes.

4.0 Precautions

4.1 The area where rigging operations will be performed shall be cordoned-off to all personnel except the "person in charge" and the technicians assigned to perform this procedure.

4.2 Some operations will require personnel to work in close proximity to suspended loads. Do not permit anyone to be positioned under the load.

4.3 Lift the octants with the commercial lifting fixture only.

5.0 Equipment List

5.1 Appropriate ANVER lifting fixture.

5.2 "C" fixture, 1200 Lb. Capacity.

5.3 Guide ropes.

5.4 Shackles

6.0 Preparation

6.1 Kinematic mounts pre-set. See drawing 002-0212-524 B1A, B2A for kinematic mount preset adjustments.

6.2 Magnet hoses tested and leak tight.

6.3 All kinematic mounts attached to magnet back plate as shown in drawing 002-0212-610 D11a,D12 and 002-0212-524 B1,B2,B3

7.0 **Procedure**

7.1 The side with the kinematic mounts face magnet back plate. Installation proceeds from the bottom of the magnet to the top beginning at 6:00 o'clock and proceeding in order 6:00,4:30,7:30,3:00,9:00,1:30,10:30,12:00.

7.2 FIRST OCTANT ONLY _ 6:00 position

7.2.1 Attach "C" fixture to the crane hook and attach the ANVER vacuum lifting fixture to the "C" fixture using a shackle.

7.3 Attach the ANVER lifting fixture to the octant in the horizontal position following the manufacturer's instructions. Lift the octant only after the vacuum pump has turned off. Rotate the octant to a vertical position.

7.3.1 For the First octant at 6:00 o'clock the octant may need to be in an intermediate position between horizontal and vertical.

7.4 Rotate the octant to the proper orientation.

7.4.1 For the First octant at 6:00 o'clock rotate the octant to an intermediate position as it is lowered and then rotate the to the 6:00 o'clock position.

7.5 Attach guide ropes to the octant.

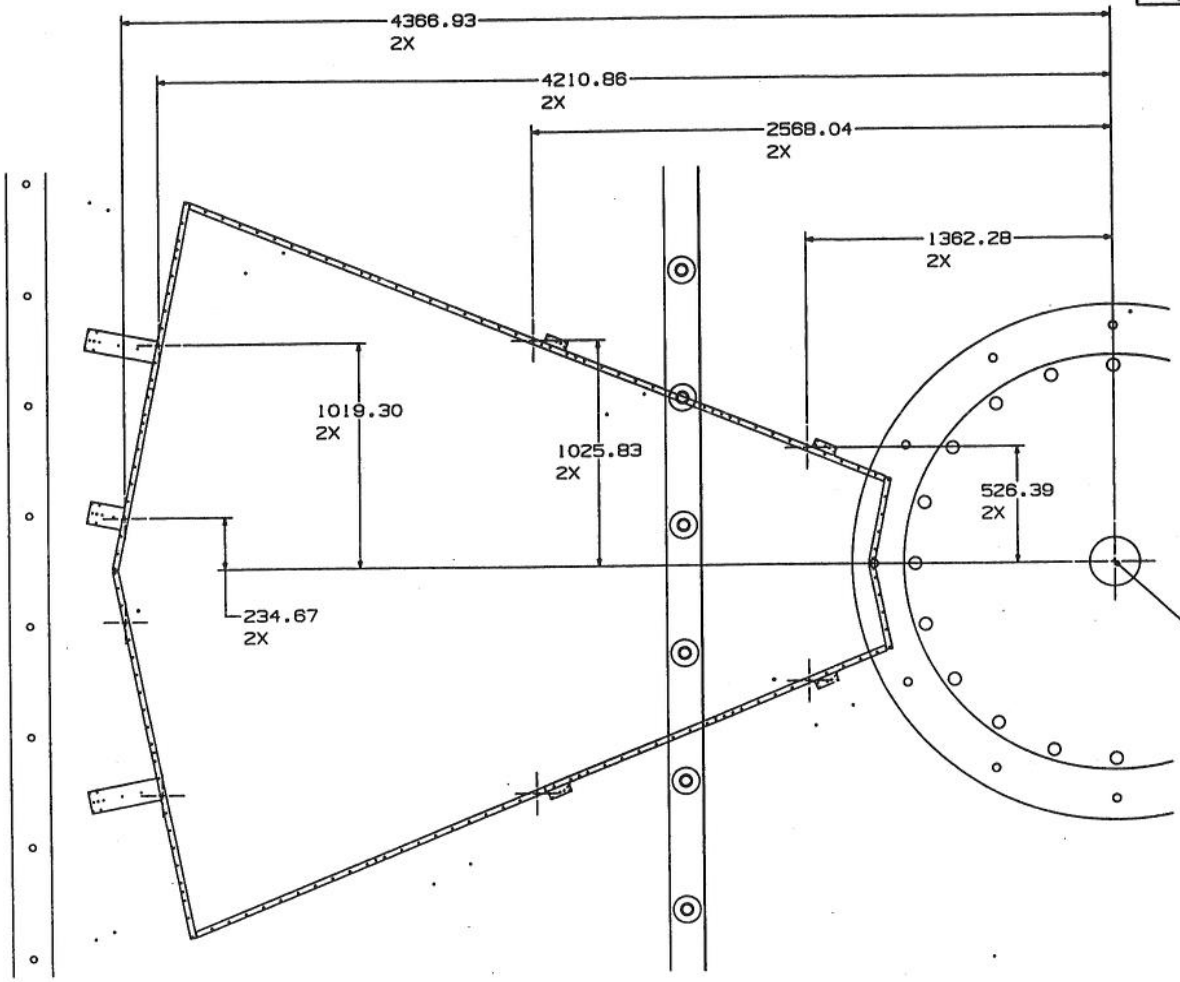
7.6 Lift and lower the octant into place on the kinematic mounts. Use guide ropes to stabilize the octant during installation.

7.7 After all octants are installed on the magnet backplate, install alignment system cameras and mounts.

8.0 **Alignment**

8.1 Survey the octants.

8.2 See projected survey points on drawings 002-0212-466 D1-D8



VIEW LOOKING NORTH

JUL 27 2001

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CLASSIFICATION OF PARTS: UNC
CLASSIFICATION OF DRAWING: UNC
TITLE BLOCKS: UNC

TITLE
NORTH ARM, STATION 3
OCTANT # 1
SURVEY POINTS

	SIGNATURE	DATE	GROUP
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PHENIX DRAWING NO. 002-0212-466

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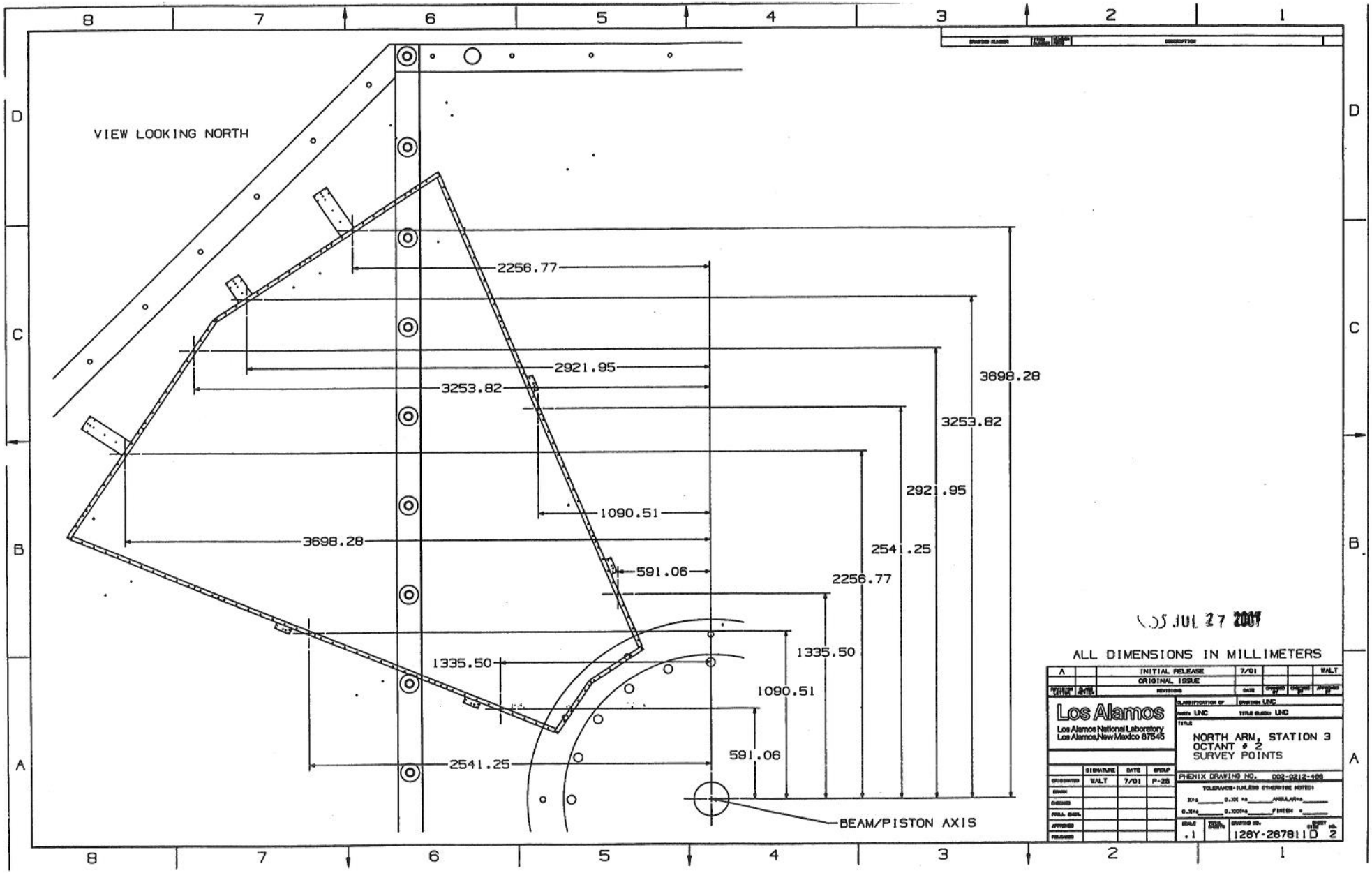

05 JUL 27 2001

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TITLE
NORTH ARM, STATION 3
OCTANT # 2
SURVEY POINTS

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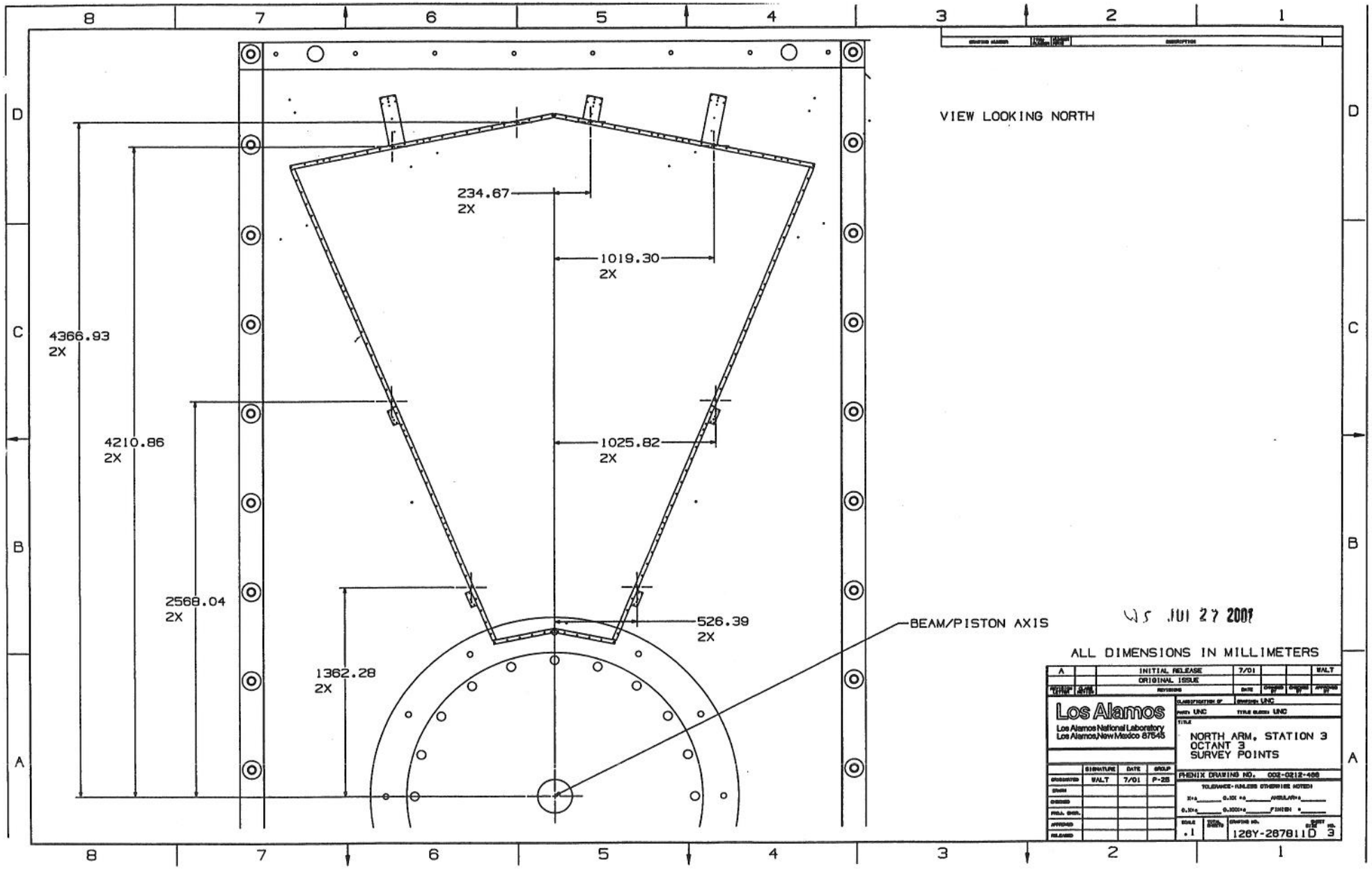
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BEAM/PISTON AXIS
ALL DIMENSIONS IN MILLIMETERS
US JUL 27 2001
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NORTH ARM, STATION 3
OCTANT 3
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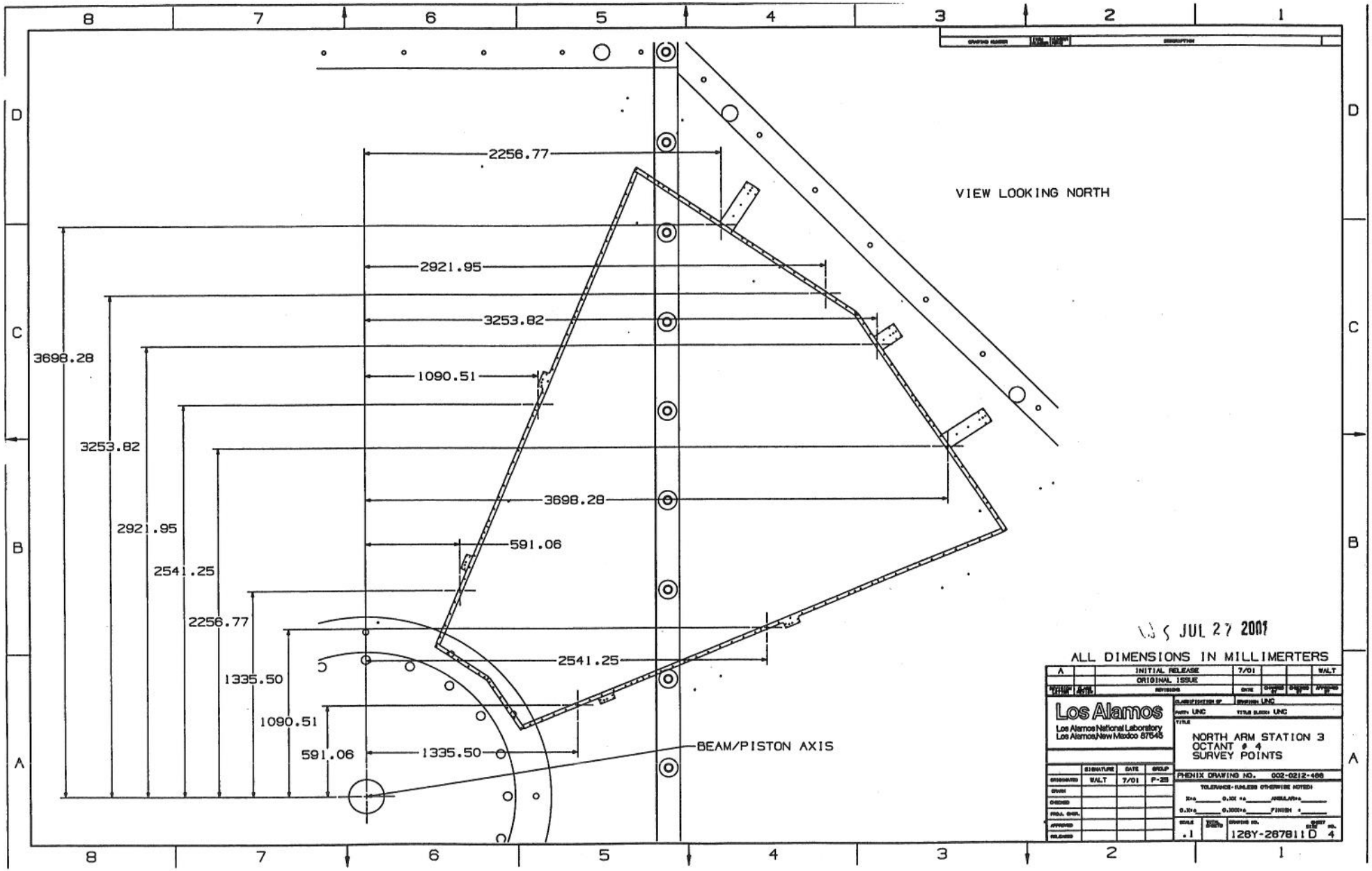
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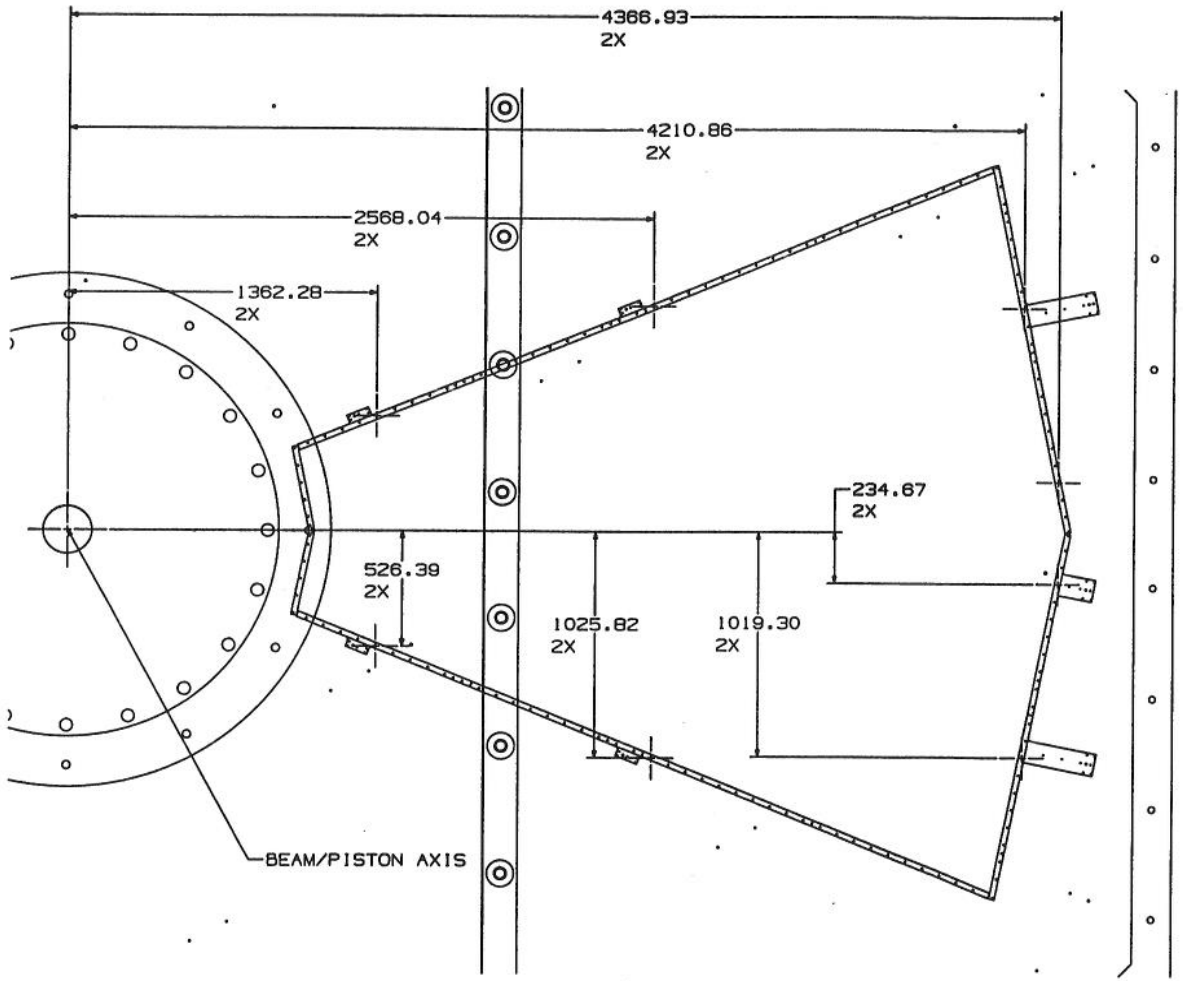

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TITLE
NORTH SRM, STATION 3
OCTANT # 5
SURVEY POINTS

PHENIX DRAWING NO. 002-0212-466

TOLERANCE - UNLESS OTHERWISE NOTED:
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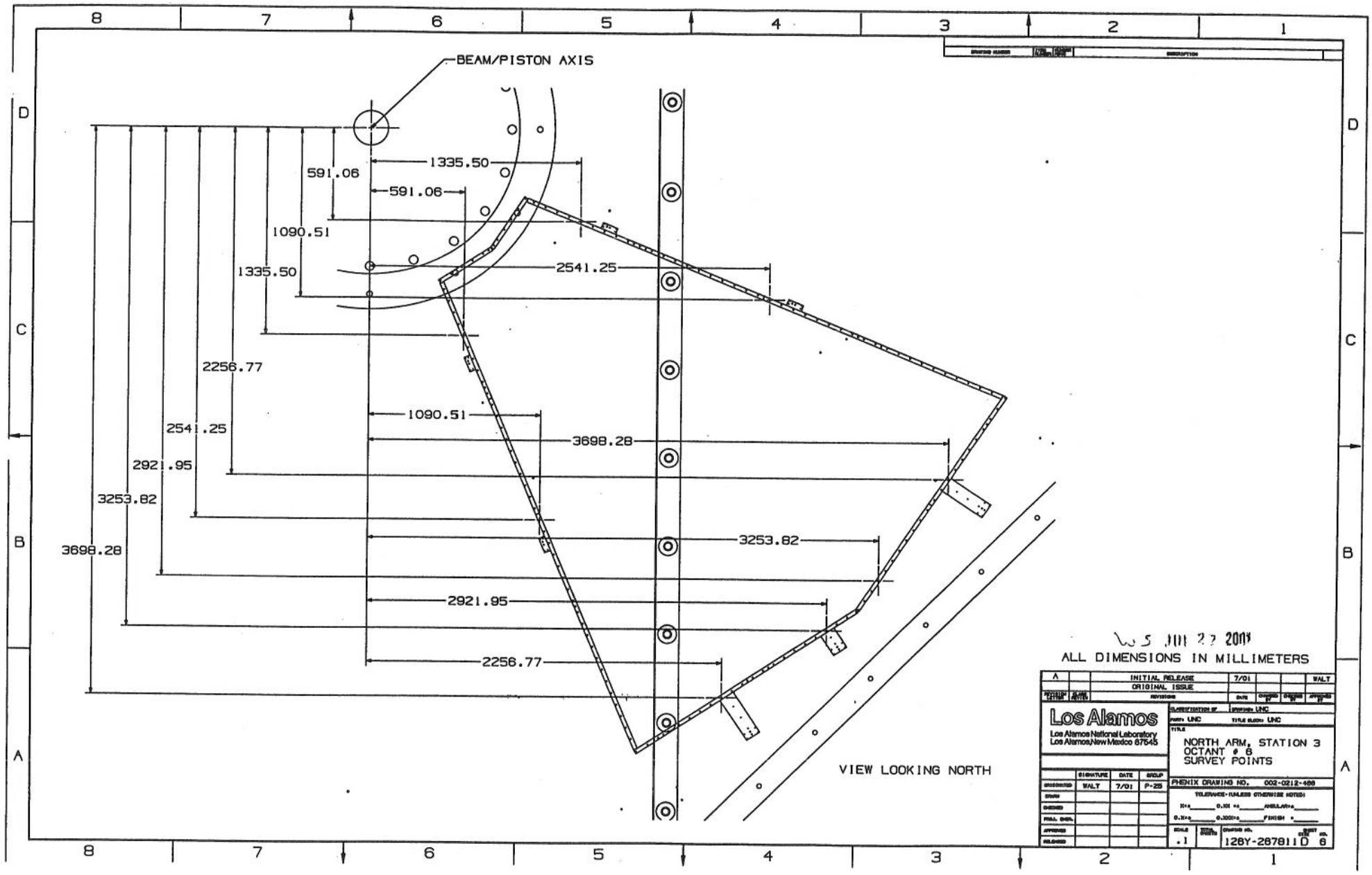

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TITLE: NORTH ARM, STATION 3 OCTANT # 6 SURVEY POINTS

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TOLERANCE: UNLESS OTHERWISE NOTED

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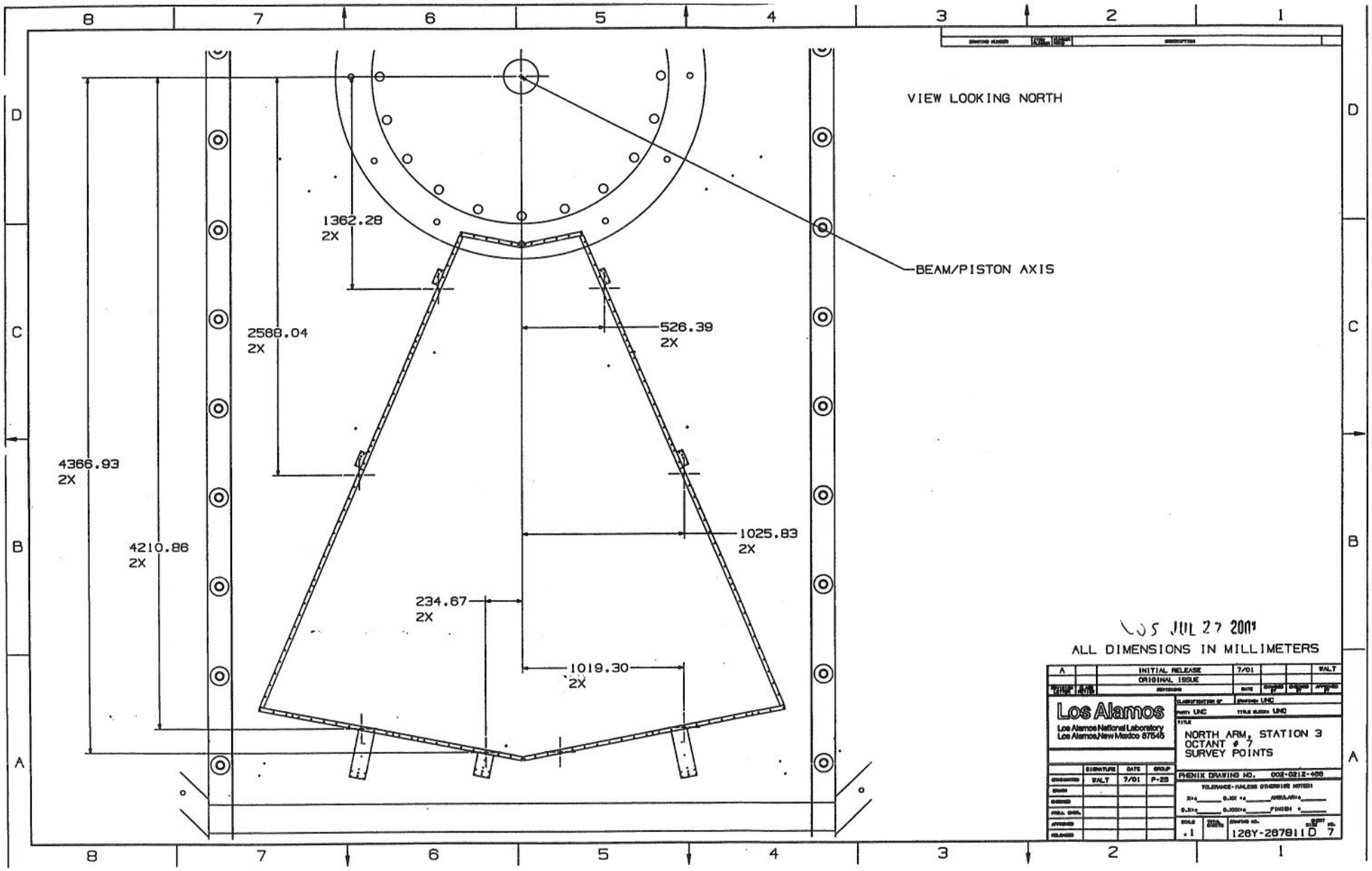
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ALL DIMENSIONS IN MILLIMETERS
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NORTH ARM, STATION 3
OCTANT # 7
SURVEY POINTS
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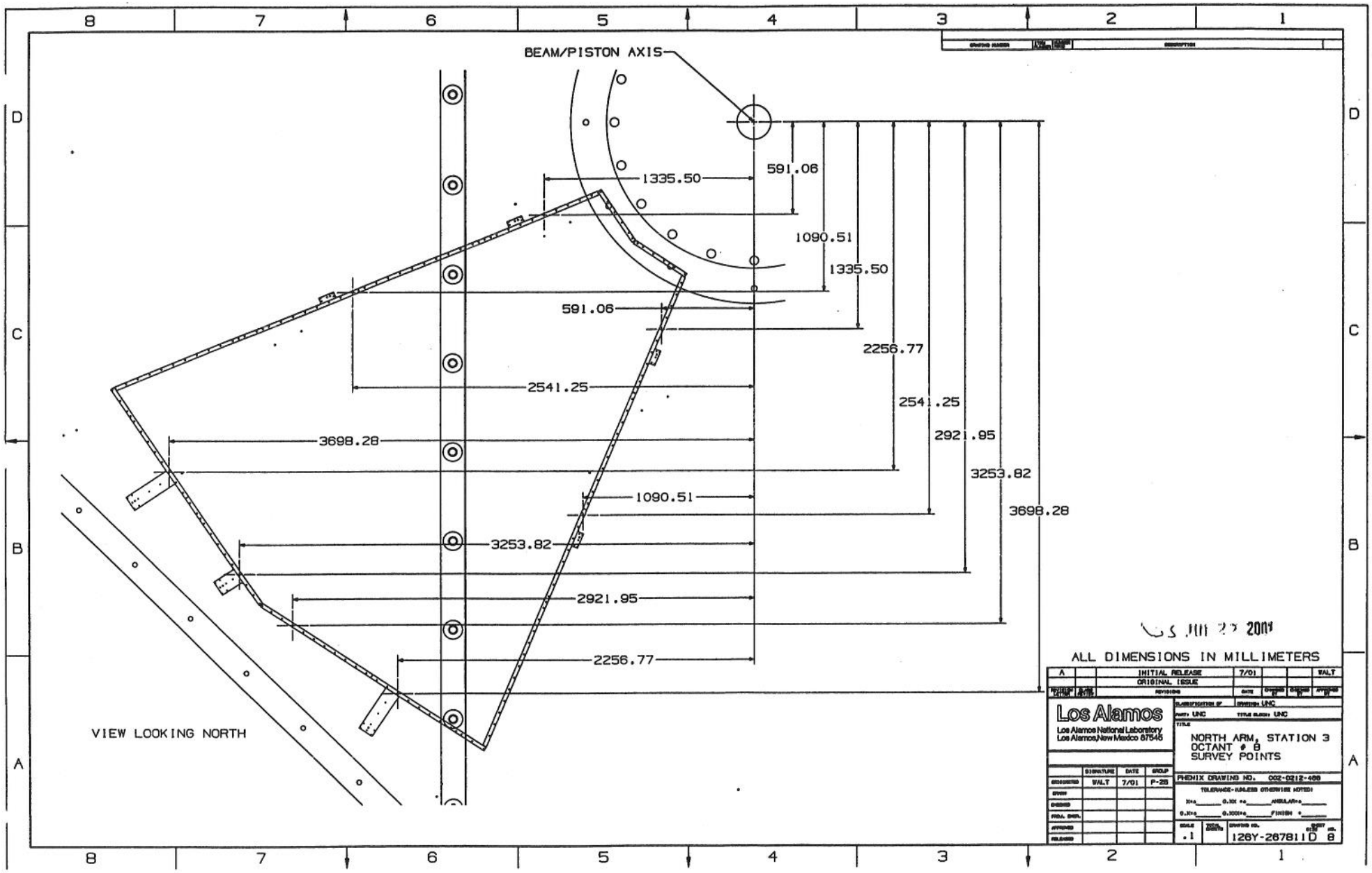

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TITLE
NORTH ARM, STATION 3
OCTANT # 8
SURVEY POINTS

PHENIX DRAWING NO. 002-0212-488

TOLERANCE-UNLESS OTHERWISE NOTED:
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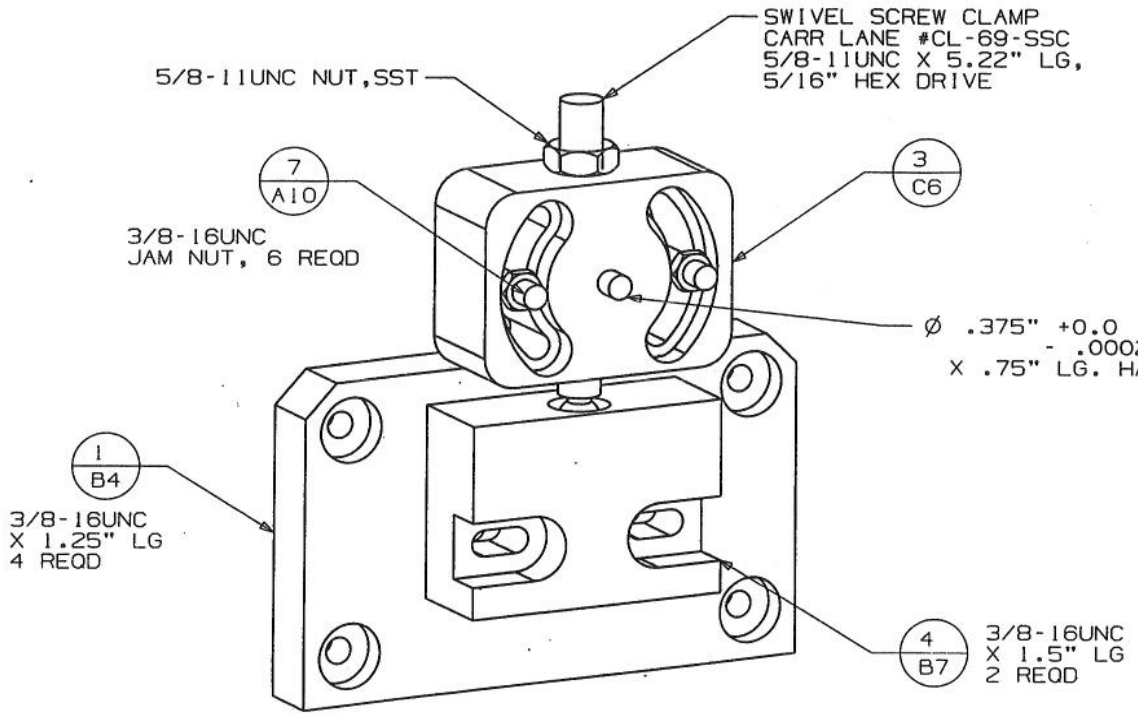

NOTE

1. ORIENTATION OF 3/8 THR. ROD MAY VARY.

SUPPORT CONE ASSY

8 REQD

X & Y ADJUSTMENT

U.S. AUG 20 1999

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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT CONE ASSY

PHENIX DRAWING NO. 002-0212-524

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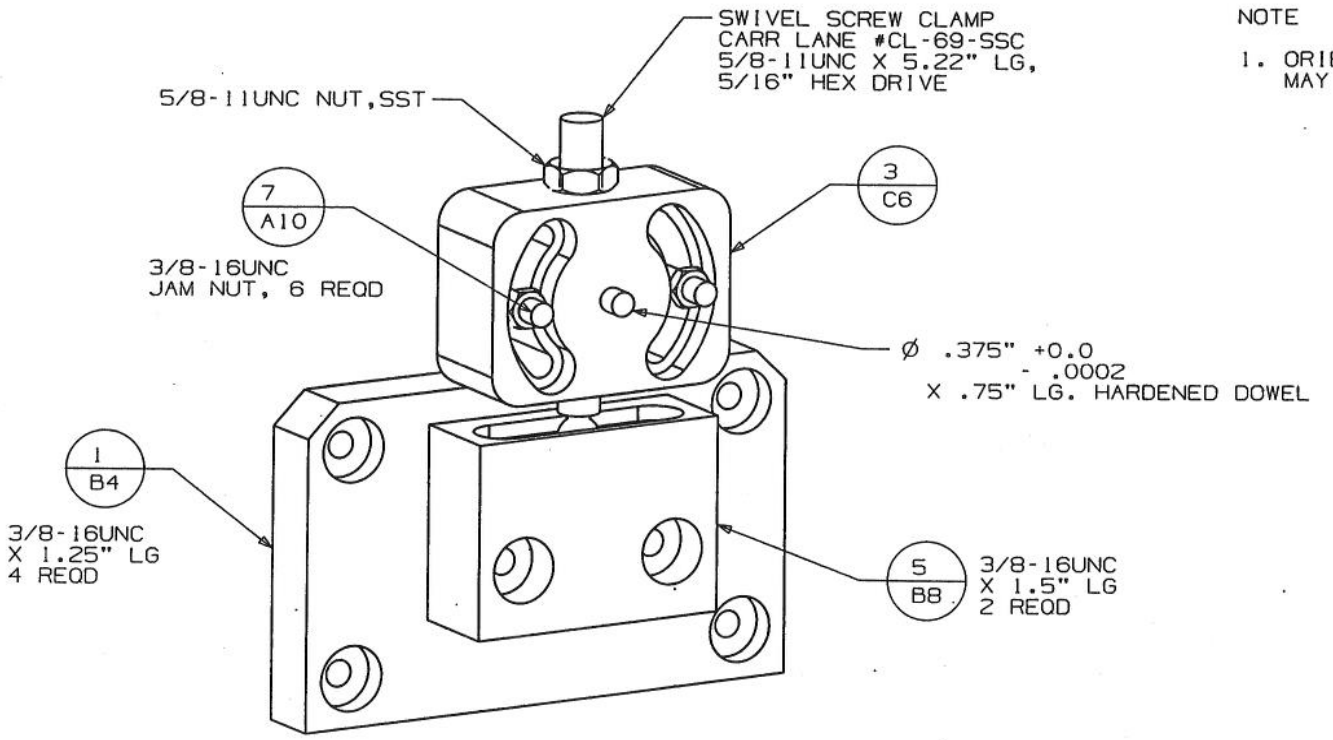

NOTE

1. ORIENTATION OF 3/8 THR. ROD MAY VARY.

SUPPORT SLIDE ASSY

8 REQD

Y ADJUSTMENT
X FREEDOM

U.S. AUG 20 1999

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TITLE
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KINEMATIC MOUNT
SUPPORT SLIDE ASSY

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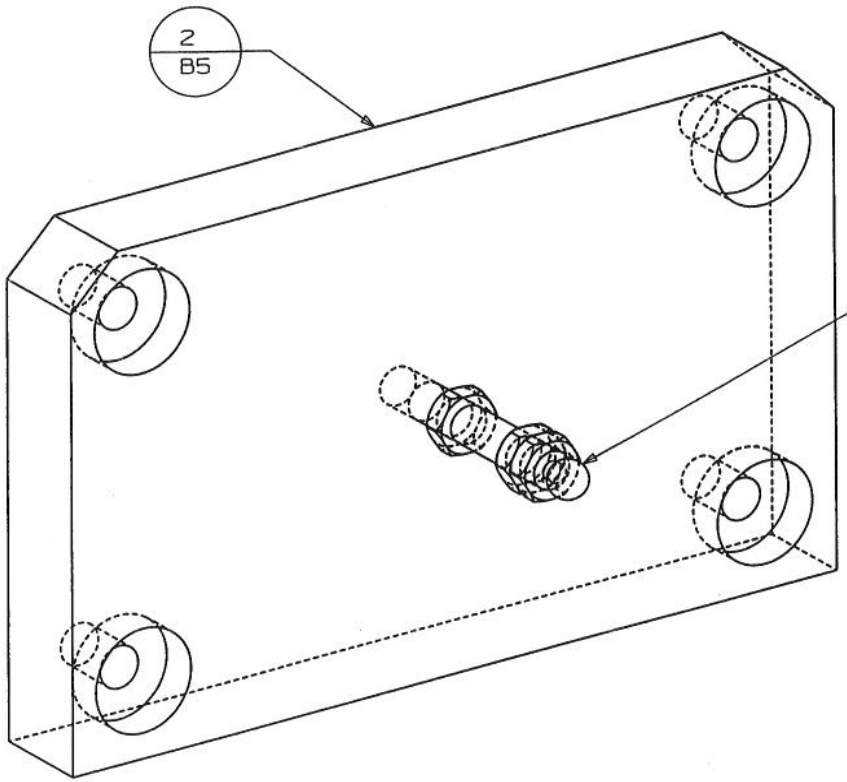

SUPPORT STOP ASSY

8 REQD

Z ADJUSTMENT
Y FREEDOM
X FREEDOM

W.C. AUG 20 1999

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TOLERANCE- (UNLESS OTHERWISE NOTED)
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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT STOP ASSY

PHENIX DRAWING NO. 002-0212-524

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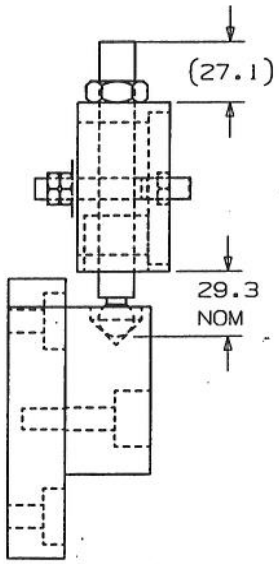

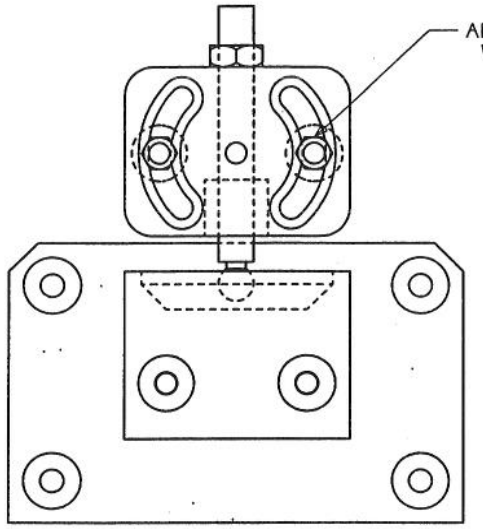

NOMINAL SETTING FOR KINEMATIC MOUNT
SUPPORT SLIDE ASSY

WS APR 17 2000

CLASSIFICATION:
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TITLE
PHENIX MUON
KINEMATIC MOUNT
SUPPORT SLIDE ASSY

PHENIX DRAWING NO. 002-0212-524

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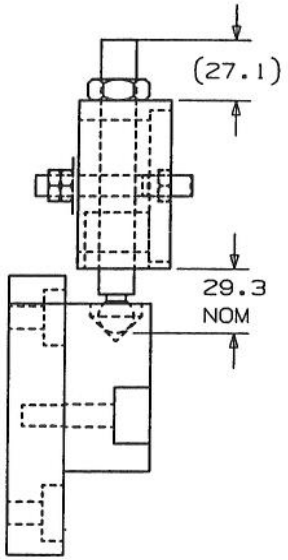

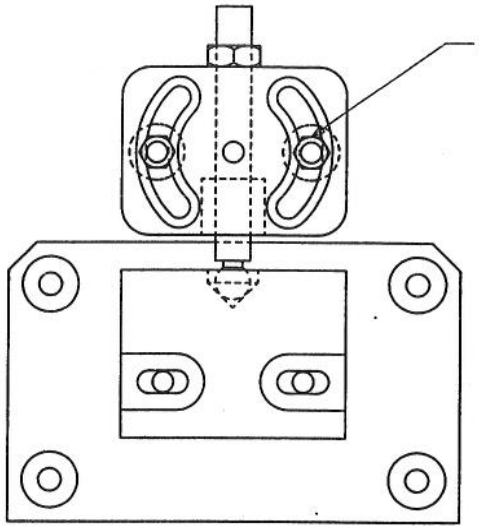

NOMINAL SETTING FOR KINEMATIC MOUNT
SUPPORT CONE ASSY

APR 17 2000

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DRAWN	CLARK	4/00	P-25
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TOLERANCE - (UNLESS OTHERWISE NOTED)
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TITLE
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SUPPORT CONE ASSY

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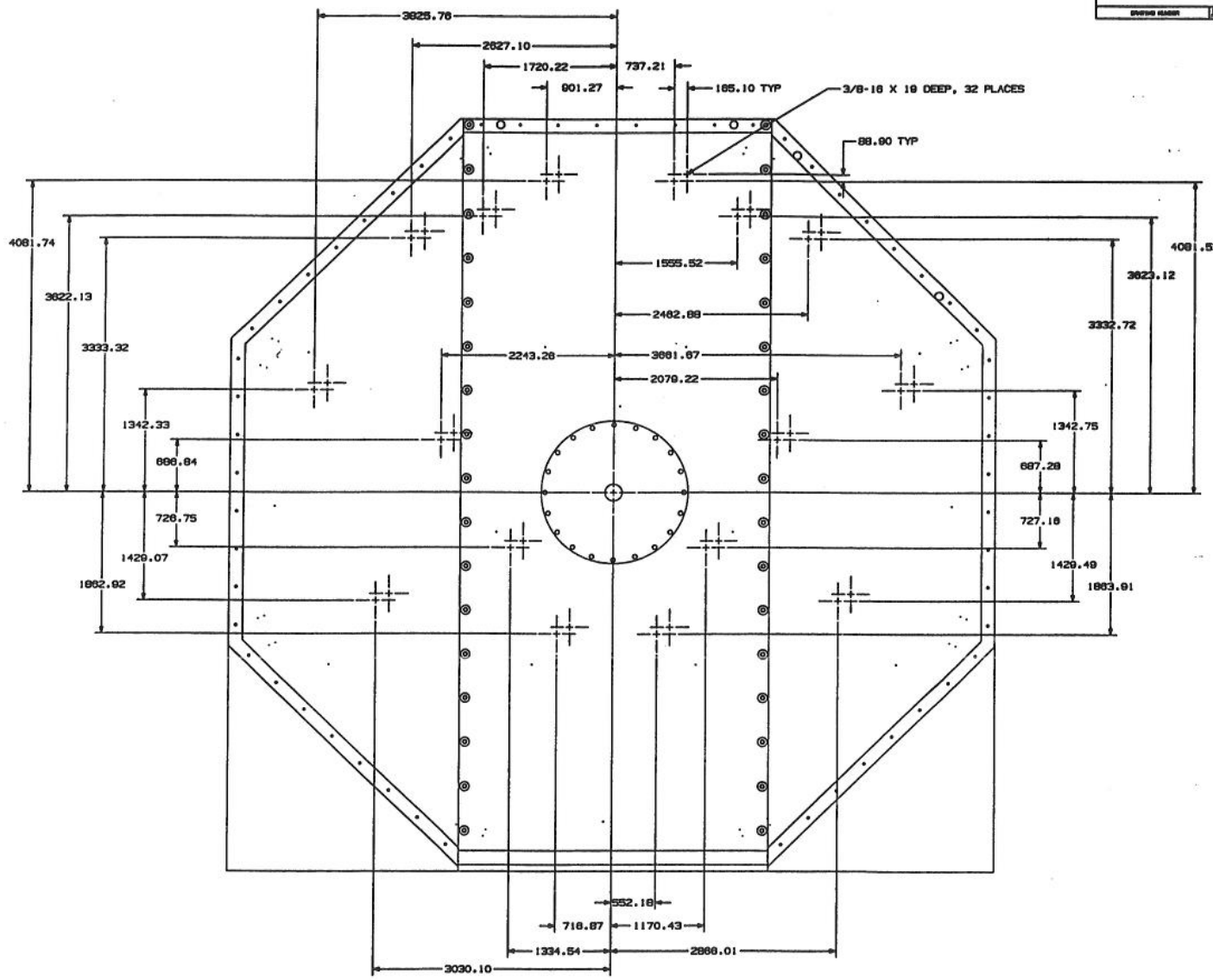

10/17/00 W.S.

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TITLE
MUON NORTH MAGNET
STATION 3 KINEMATIC
MOUNT HOLES

	SIGNATURE	DATE	GROUP
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CHECKED	JAN	10-00	P-25
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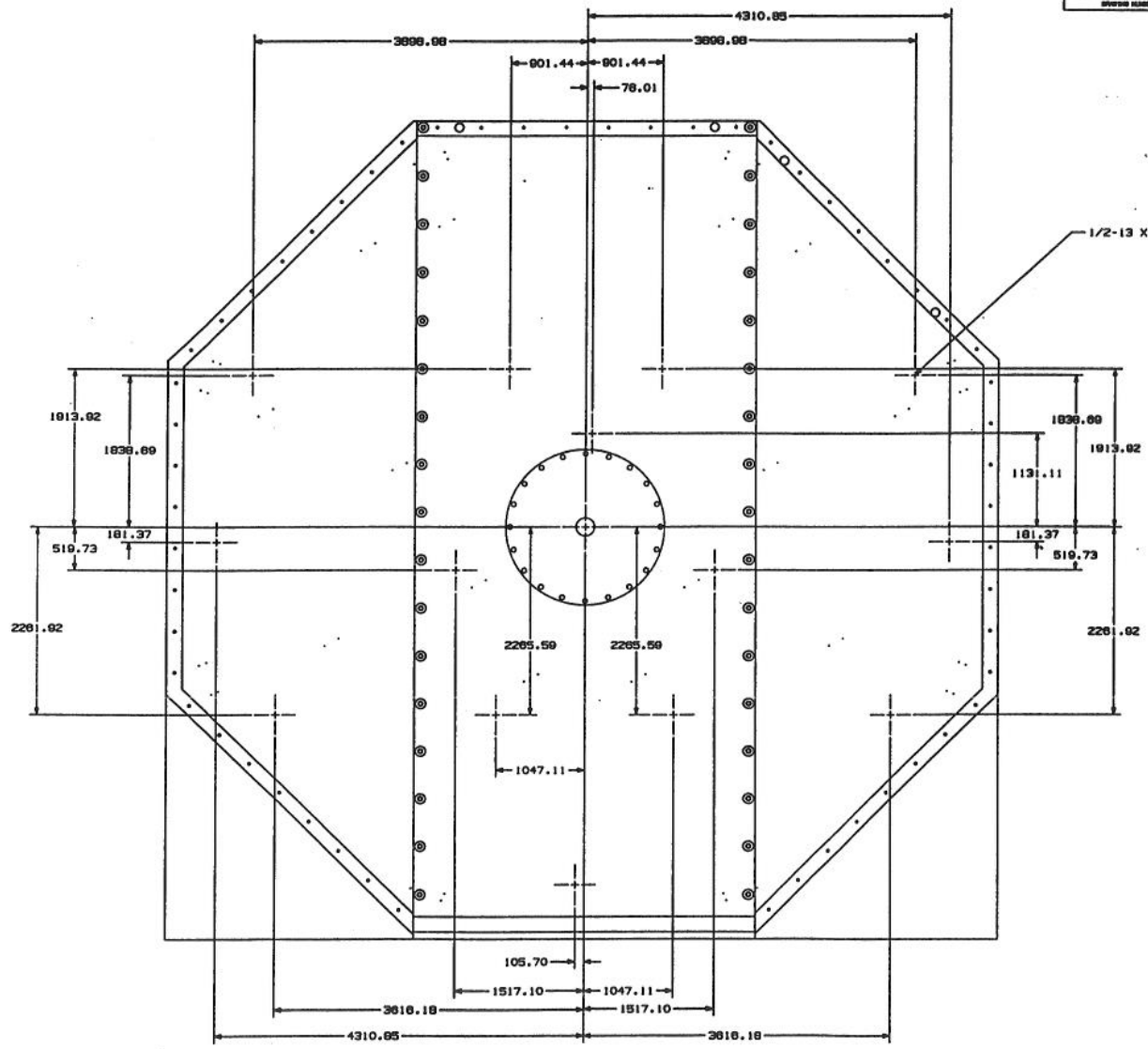

10/17/00 D.S.

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CLASSIFICATION #: DIVISION: UNC
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TITLE
MUON NORTH MAGNET
STATION 3
Z MOUNT HOLES

PHENIX DRAWING NO. 002-0212-810-13

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SCALE: 1/6 | DRAWING NO. 126Y-267802 | SHEET 1 OF 1 | SIZE D | REV 11A

Brookhaven National Laboratory

PHENIX MMN, MMS and Station 1 Scaffolds

Scaffold Safety Checklist

Project & Scaffold:	Job #	WO #:
Date of Inspection:	Competent Person(s):	
Date Scaffold is complete:		

	YES	NO	COMMENTS
1. Have all personnel been trained in the safe use of the scaffold being used?			
2. Is a 'Competent Person' in charge of scaffold erection, dismantling, moving, or alteration?			
3. Have hazardous conditions been identified and guarded against, such as: Electric power lines?			
Be Beampipe protected?			
MuTr chambers covered?			
Magnets locked out?			
4. Is the scaffold erected in accordance with design drawings?			
5. Are scaffold components and planking in safe condition for use and is plank graded for scaffold use?			
6. Are base plates and/or screw jacks in firm and stable contact with the base surface?			
7. Is scaffold level and plumb?			
8. Are all scaffold legs braced and are all braces properly attached?			
9. Is the scaffold platform free of makeshift devices or ladders to increase the working height of the scaffold?			
10. Are guardrails installed properly, including toeboards?			
11. Are guardrails in place on all open sides and ends of scaffold platforms above 6' in height?			
12. Have all joints been secured with set screw and torqued to mfr. tolerances (screw heads to be marked to verify.			
13. Has scaffold been secured to building or structure at least every 30' in length and 26' in height?			
14. Have free standing towers been guyed or tied every 26' in height?			
15. Has scaffold been inspected and approved by C-A designated inspector(s)?			
16. Use space below and back of page for additional comments.			